CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical, power, foundry and allied fields.
Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

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Starrett Hack-Saws

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Not Yet!

Don't be satisfied by selecting "Starrett" until you also select a numbered Starrett.

While it is true that

Starrett Hack-Saws

are unexcelled—made of the best material and all that—it's equally true that the hack saw that will do the best work, and do it most economically, is one suited to the job; in short, a "Starrett" of the right number. The numbers on the Starrett Saws show what they should be used for. What the numbers mean and how they are used to spell economy is explained in Catalog No. 213.

STARRETT HACK SAWS CUT QUICKER LAST LONGER

The L. S. Starrett Company
THE WORLD'S GREATEST TOOLMAKERS
ATHOL, MASS.

New York London Chicago

42-745

When History Opens The Purple Testament of Bleeding War . . . . .

Every man and woman who has played a part will bear a record.

Your name may not be writ among those of the immortals—

But for honour's sake see to it that it is writ on the Scroll with those who at least placed their money at the service of their country.

Shall it be said that Canada spares not her sons from the sacrifice of death, yet withholds her dollars needed to give them Victory?

Buy Victory Bonds

This Space Donated by Pratt & Whitney of Dundas.

Greater Love Hath No Man Than This

Half hidden in the files of the London Gazette, where it is set forth with all the ponderousness of official language, is a story of self-sacrifice that stands out pre-eminently, even in this age of deeds of superlative courage and super-chivalry.

The record is contained in the announcement of the award of the Albert Medal of the First Class to Lance-Corporal Charles Henry Anderson, late of the 1-14th Battalion of the London Regiment, who lost his life in France in November last. The official narrative is as follows: On November 28, 1916, Lance-Corporal Anderson was in a hut in France, with eleven other men, when, accidentally, the safety-pin was withdrawn from a bomb. In the semi-darkness he shouted a warning to the men, rushed to the door, and endeavored to open it so as to throw the bomb into a field.

Failing to do this, when he judged that the five seconds during which the fuse was timed to burn had elapsed, he held the bomb as close to his body as possible with both hands in order to screen the other men in the hut. Anderson himself and one other man were mortally wounded by the explosion, and five men were injured. The remaining five escaped unhurt. Anderson sacrificed his life to save his comrades.

Canada's Victory Bonds

The Nation's Guarantee for Safety

If patriotism means what it should to us to-day there will be quick and hearty response to Canada's call for money—more money to win the War.

Every person who buys Victory Bonds will know that he is in the path of duty and is really helping to win the war—and every red-blooded man or woman who has the privilege of living under the flag of Empire in Canada is invited to have a part in prosecuting the war to a speedy end by subscribing to the utmost to the Victory Loan.

It is the safety of your country—the safety of your home—the safety of yourself—the safety of your children—the safety of your liberty—that Victory Bonds will protect—"Do your Bit"—to-day.

Buy Victory Bonds

Space Donated by
Bertram's Limited
Dundas

The Publisher's Page

TORONTO November 22, 1917

Value of Business Newspapers

EDWIN N. HURLEY, the financier and successful manufacturer, who recently retired as chairman of the Federal Trade Commission in the United States, but has just been persuaded to return to the public service, as chairman of the Shipping Board, says regarding trade and technical journals in his book, "The Awakening of Business":—

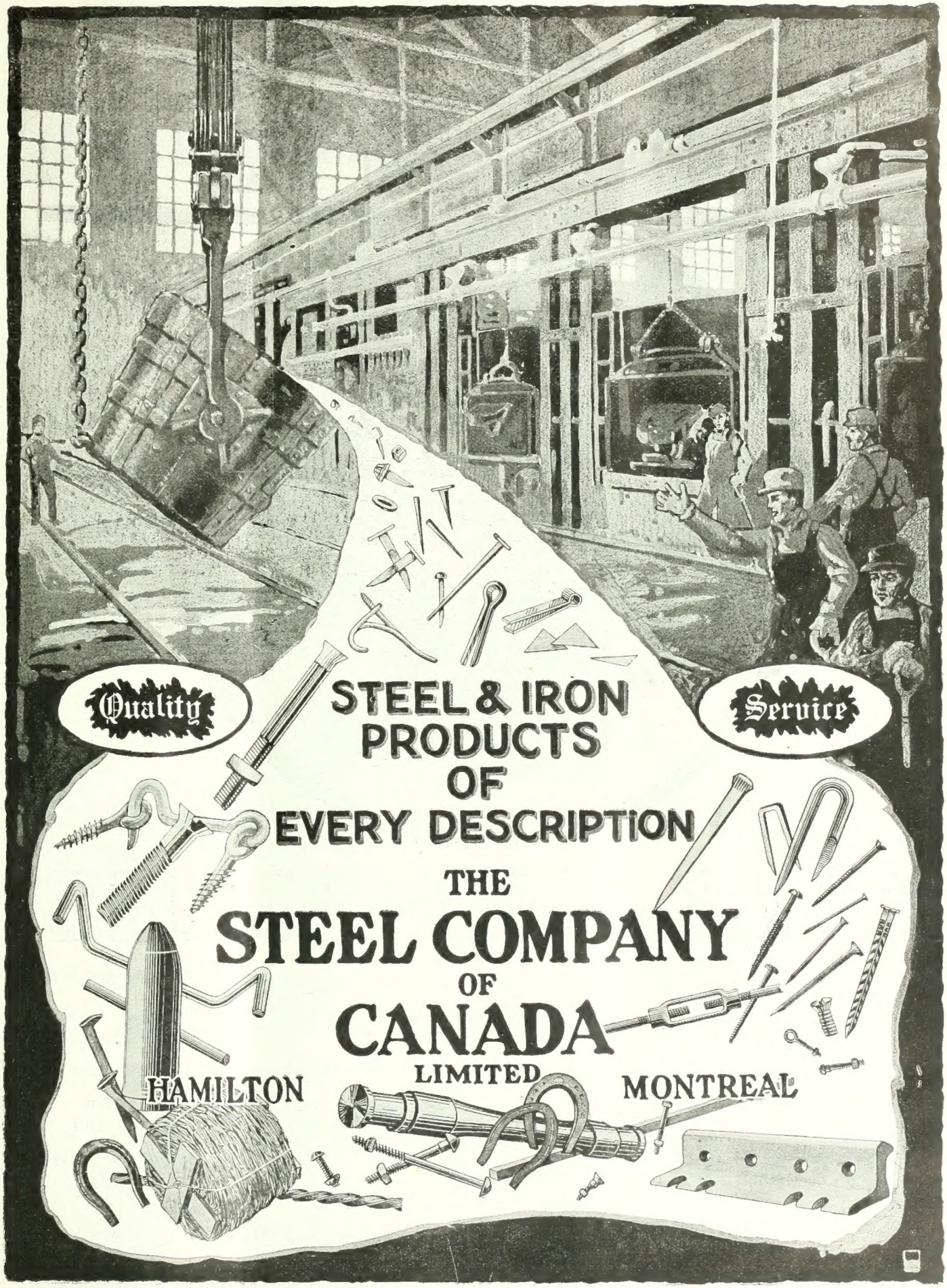
"Business men do not realize the value which trade newspapers and technical magazines may be to them in increasing the efficiency of their factory and giving them a broad, comprehensive view of their business.

"Our trade journals and technical papers should be encouraged and supported by our business men.

"Copies should be placed where employees can see them, and they should be urged to read and study them.

"These papers are preaching the gospel of sound business on practical lines, and are helpful, not only to business, but to the country as a whole."

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.


Quality
Service
STEEL & IRON
PRODUCTS
OF
EVERY DESCRIPTION
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STEEL COMPANY
OF
CANADA
LIMITED
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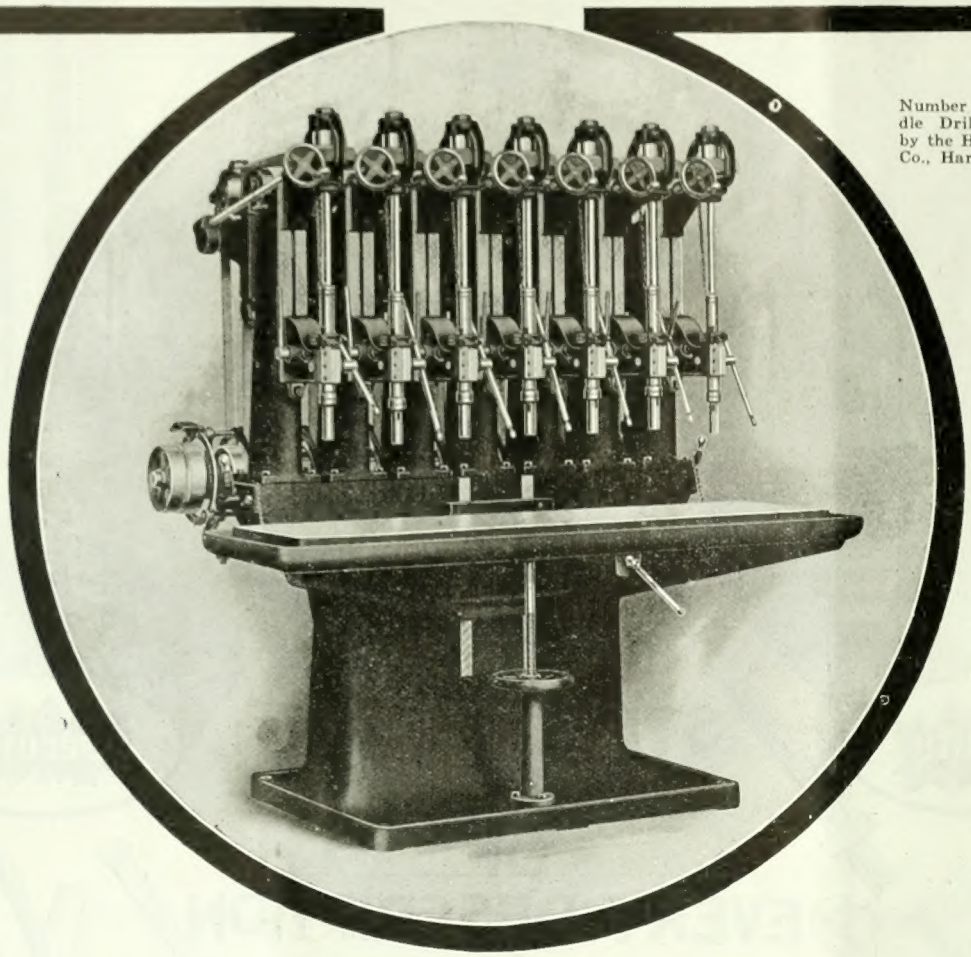
SKF



Number 7, Class B—7 Spindle Drilling Machine made by the Henry & Wright Mfg. Co., Hartford, Conn.

BALL BEARINGS

No. 4 of a Series of SKF Equipped Drilling Machines

SPEED

Bearing reliability is in a great measure responsible for high speed drill success.

S K F in your drilling machine insures reliability at high speed and under continuous service. The common ailments of the high speed drill—wear, heating and binding are reduced, by the installation of S K F, to a minimum.

To equip with S K F is to establish quality. Can we assist you?

Canadian SKF Company, Limited
TORONTO, ONT., CANADA

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"ULTRA CAPITAL" HIGH SPEED STEEL

Balfour's Tool Steel

"CAPITAL" HIGH SPEED TWIST DRILLS

MANUFACTURED BY

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Sheffield, England.

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Head Office and Warehouse, Canada and U.S.
Ontario Office and Warehouse
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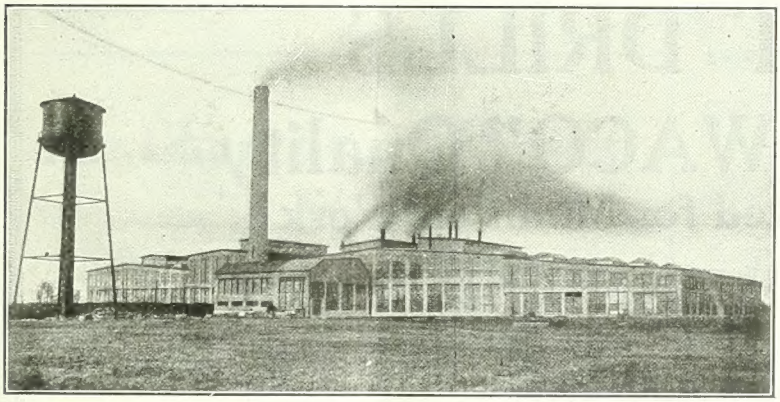
36 Colborne Street, Toronto
Dominion Equipment & Supply Co. Limited
Frank Darling & Co.

W. A. BRADBURY, Agent, 128 Craig Street West, Montreal



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Standard Sizes of
HIGH SPEED STEEL
Carried in Stock
CARBON AND ALLOY STEELS
Shop Tools, Gauges, etc.

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Branches: Dominion Bank Bldg., TORONTO
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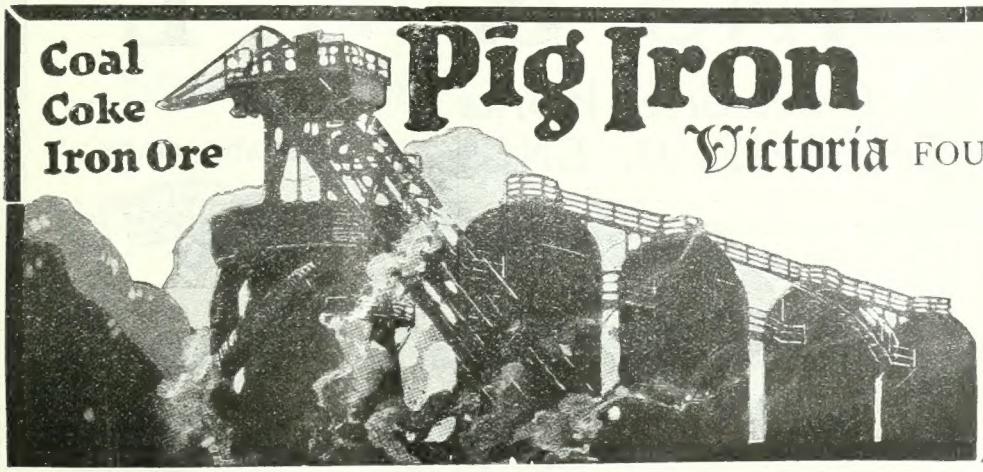
Coke
Iron Ore



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Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada.

M.A. HANNA & CO.

Sales Agents, CLEVELAND

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of the Famous

"WACO"

BRAND

HIGH SPEED STEEL

AND

TWIST DRILLS

"DOUBLE WACO" Quality

Specially Adapted for Munition Work

"TURTLE" BRAND

High Class Tool Steel, Files, etc., of all descriptions.

ESTABLISHED 1870

WM. ATKINS & CO., LTD.

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Reliance Steel Works

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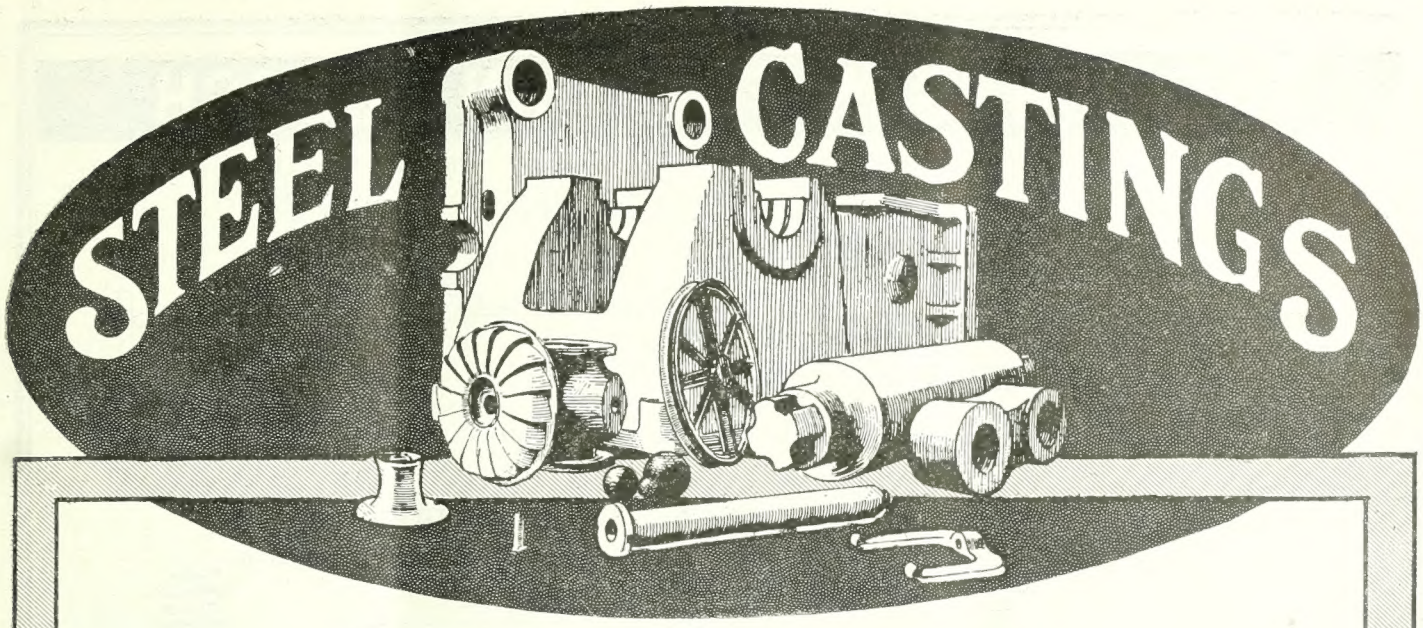
For particulars apply to our

Sole Representatives for Canada

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario



Manganese, Vanadium, Titanium, Chrome, Nickel Castings made in sizes from 1 lb. to 50 tons. Made to specifications and true to pattern. You can thoroughly depend on our products.

CANADIAN STEEL FOUNDRIES, Limited

MONTREAL *WELLAND*

Air Chucks for 6" Shells in Stock

General Machine Work of All Kinds

Gear Cutting, Etc.

Hyde Engineering Works

27 William St., Montreal

P.O. Box 1185
Telephones: M. 1899 & M. 2527

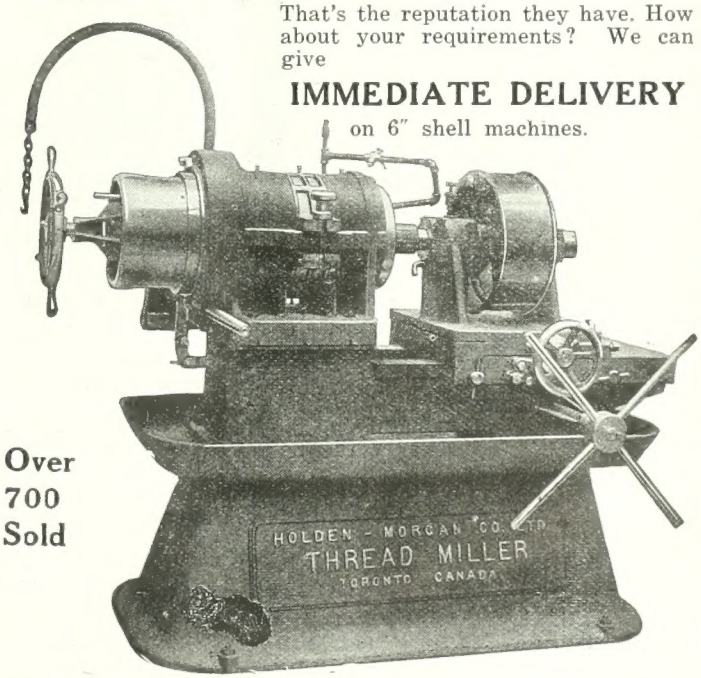
70 Holden-Morgans in One Plant

Another firm would not accept a contract until assured they could get HOLDEN-MORGANS.

That's the reputation they have. How about your requirements? We can give

IMMEDIATE DELIVERY

on 6" shell machines.



Over 700 Sold

THE A. R. WILLIAMS MACHINERY CO.
W. FRONT ST. (Limited) TORONTO

THE JOHNSON FRICTION CLUTCH

STYLE A SHIFTER

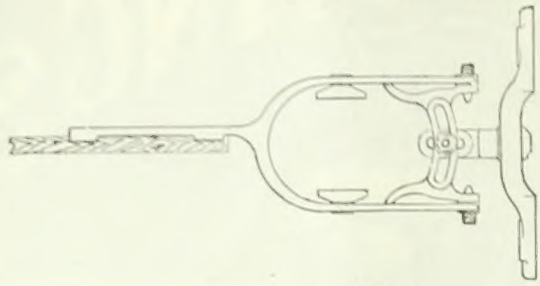


Fig. A

STYLE B SHIFTER

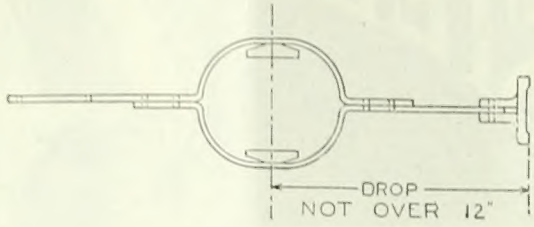


Fig. B

STANDARD SINGLE CLUTCHES WITHOUT PULLEY

Clutch Size Number	PRICE, EACH With Style A Shifter	With Style B Shifter	Without Shifter	PRICE, SPECIAL PARTS PER CLUTCH Driving Collar	*Self-lubricating Cast Iron Bearing	Plain Bronze Bearing	*Self-lubricating Bronze Bearing
0	$23.00	$22.00	$21.00	$ 4.00	$ 4.00	$10.00	$12.40
2	26.50	25.00	24.00	4.80	4.80	12.00	14.40
4	30.00	28.50	27.50	6.00	6.00	15.60	18.00
5	34.00	32.50	31.50	6.60	6.60	18.00	20.40
6	38.00	36.25	35.00	7.20	7.20	20.40	22.80
8	48.00	46.25	45.00	8.40	8.40	21.60	24.00
10	60.00	57.25	55.00	10.40	10.40	23.40	25.80
11	80.00	76.25	73.00	12.40	12.40	25.40	27.80

Prices for bearings cover one bearing, the length of the standard clutch hub. Prices including any style pulley on application.

STANDARD DOUBLE CLUTCHES WITHOUT PULLEYS

Clutch Size Number	PRICE, EACH With Style A Shifter	With Style B Shifter	Without Shifter	PRICE, SPECIAL PARTS PER CLUTCH *Self-lubricating Cast Iron Bearing	Plain Bronze Bearing	*Self-lubricating Bronze Bearing
0	$38.50	$37.50	$36.50	$ 8.00	$20.00	$24.80
2	41.50	40.00	39.00	9.60	24.00	28.80
4	45.00	43.50	42.50	12.00	31.20	36.00
5	51.50	50.00	49.00	13.20	36.00	40.80
6	58.00	56.25	55.00	14.40	40.80	45.60
8	70.00	68.25	67.00	16.80	43.20	48.00
10	82.00	79.25	77.00	20.80	46.80	51.60
11	102.00	98.25	95.00	24.80	50.80	55.60

Prices for bearings cover two bearings the length of the standard clutch hubs. Prices including any style pulley, on application.

DIRECTIONS FOR ORDERING

Give exact diameter of shaft (necessary to determine size of clutch required). Is single or double clutch required? Speed to run (necessary to determine whether self-lubricating bearing is required). Approximate horsepower (necessary to determine size of clutch required). Style of shifter. Drop of hanger. How to ship.

IMPORTANT: If drop of hanger in Style A or Style B shifters is more than 12 inches, block down from ceiling to shifter base.

The drop from the center of the shaft to the ceiling should never be made more than 12 inches. In all cases make it less if possible. Shifter handle length should be 6 times the length of drop.

*Made to use oil (low speeds) or grease (high speeds).

Write for booklet "Clutches as Applied in Machine Building," yellow data sheets and discount.

Canada: Williams & Wilson, Ltd., 320 St. James St., Montreal; Can. Fairbanks-Morse Co., Ltd., Toronto.
England: The Efandem Co., 159 Gt. Portland St., London, W., Sole Agents British Isles.
Australia: Edwin Wood, Pty., Hardware Chambers, 231 Elizabeth St., Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

We will Fill Your Requirements *Send Us Your Inquiries*

Air Compressor Evidence

The greatest evidence of the value of any article is the demand for it after investigation and trial. Below are four carloads of our compressors which fills one order to a large concern in Canada. Our line of compressors is very large.

Write us and explain your requirements

The Jenckes Machine Company, Limited

CANADIAN SALES OFFICES:

WORKS: Sherbrooke, Que.

Sherbrooke, Montreal, St. Catharines, Toronto
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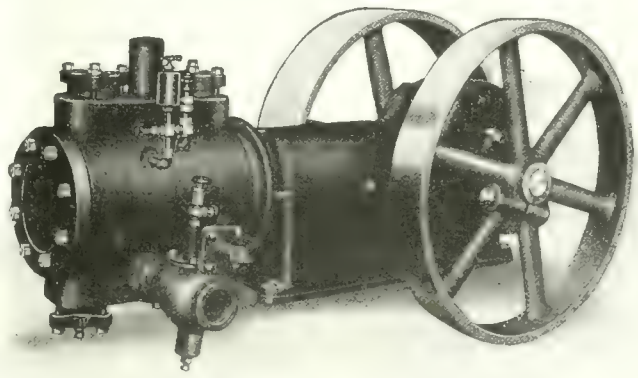
THE MACHINE SHOP COMPRESSOR

Automatic Lubrication.
Compact and Self-Contained.
Simple Foundation.
Dust-Proof Construction.



Speedy Installation.
"Circo" Leaf Valves.
Efficient and Silent.
No Valve Gear.
Parts Easily Replaced.
Low Repair Cost.

Class "EL-1" Power-Driven, Single-Stage, Straight Line Air Compressor

The simplicity of this machine, and the very small amount of attention it requires, make it particularly useful to machine shops requiring small or medium size compressors.

Bulletin K-300-A describes this type of compressor fully. Our nearest Branch will be glad to mail you a copy.

CANADIAN INGERSOLL-RAND COMPANY, LIMITED

COMMERCIAL UNION BUILDING
MONTREAL - - CANADA

Branches: SYDNEY SHERBROOKE MONTREAL TORONTO COBALT TIMMINS WINNIPEG NELSON VANCOUVER

BUY VICTORY BONDS SAFEST INVESTMENT IN CANADA TO-DAY.

ONE Shot—

"Red Cut Superior"

The Nationally Known
First Quality
HIGH SPEED STEEL

VANADIUM-ALLOYS STEEL CO.
PITTSBURGH, PA. Works at LATROBE, PA.

High-Speed STEEL

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

VULCAN CRUCIBLE STEEL COMPANY
ESTABLISHED 1900
Aliquippa - Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.

Electrite

Electric furnaces, automatically regulated, the most modern methods, and **the introduction of Uranium**—make this a steel of truly remarkably cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.
LATROBE, PA.

High Speed Steel

Uranium

The

Fairley Davidson Steel Co., Inc.

SPECIALISTS

	Brand Name:
Hot Working Steels	"Xtof" and "Precision"
High Strength Steels	"Hehtemnd"
High Speed Steel	RUSHITOFF No. 6
Tool and Die Steels	"Fondwot" and "Giant"
Magnet Steels	Tungsten or Chrome
Non-Changeable Die Steel	Nugget "B" oil hardening

CHROME VANADIUM, oil hardening or case hardening

CHROME NICKEL, oil hardening or case hardening

Steam Hammer Forgings to Sketch

We guarantee to supply the correct steel at once, eliminating costly experiments

We carry a complete stock at our New York Warehouse, 124 Maiden Lane, New York City

Canadian Agents:

THE FACTORY SUPPLY AND STEEL COMPANY

149 Craig Street West, Montreal, Canada

We carry a complete stock at our Montreal Warehouse

Uranium High Speed Steel

STRENGTH

Strength in a high speed cutting tool is rather difficult to understand. Here's what we mean:—

Uranium high speed steel cutting tools are TOUGH. They are hard. They have ductility. They retain their cutting edge much longer than ordinary steel.

Why are they so strong? Because they contain Uranium—the alloy of strength and toughness in them.

Get in touch with us to-day. Try out Uranium on your hardest job—the harder the test the better.

STANDARD ALLOYS COMPANY

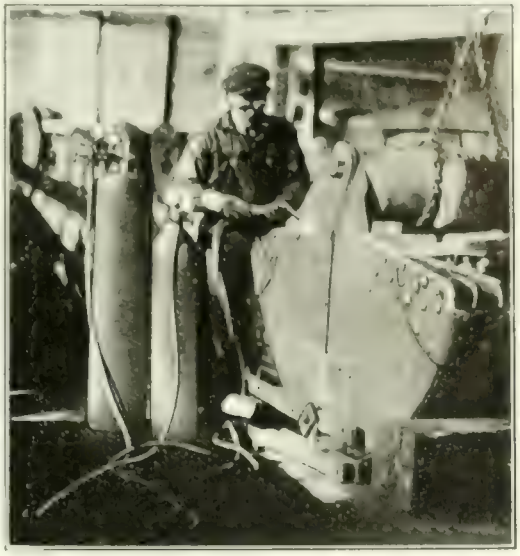
Forbes and Meyran Avenues **PITTSBURGH, PENNA.**

Building Up and Preserving Worn or Broken Parts by Oxy-Acetylene Welding

Why have hundreds of dollars' worth of machinery idle?

With an Oxy-Acetylene Welding Outfit as part of the equipment of your Plant, "breakages" can be quickly and cheaply repaired as they occur. There is absolutely no reason why your Production should decrease to any appreciable extent because an important machine part has broken and you cannot get a replacement. A Welding Outfit will take care of all "breaks," big or little, and keep your equipment in constant service.

And what about the saving of cost of replacements?



Prolonging the life of a Steam Shovel by Oxy-Acetylene Welding.

Why not keep your Plant 100 per cent. efficient?

Practically the whole world is calling for your Products. Why take a chance of everything going all right in your Plant? At any time a serious breakdown may occur and throw your whole machinery out of operation, or at least an important part of it. Your losses in a case like this would be incalculable, and the delay in trying to obtain replacements would play havoc with your total production.

The time to investigate the Oxy-Acetylene Process is now.

Write us at once on your letter-head and mail to us. Full particulars of interest and benefit to you regarding the Process and our Service will be sent you by return.

Manufacturers of Oxygen and Dissolved Acetylene. Welding and Cutting Plants.

L'AIR LIQUIDE SOCIETY

Pioneers of the Oxy-Acetylene Process throughout the world.

Canadian Factories: Toronto Montreal Winnipeg Halifax: Under construction.

We guarantee shipment within 24 hours of receipt of order

"Extra" "Special" "High Speed" **Tool Steels**

SISCO

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
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Manufacturers of

Shell Forgings

We have the Equipment and Experience and can execute orders for

Nose Sockets Base Plates Adapter Plates

for any size shells. Can execute orders promptly.

SPECIAL FORGINGS—We can make any forgings that can be made under Drop Hammers.

CHAINS AND ACCESSORY FORGINGS—We have a complete line.

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JOHN A. BUCHANAN
King Edward Hotel, TORONTO

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WELDING COMPOUND

"We have been using 'Stellite' Welding Compound for the past month, obtaining excellent results. We have tried other compounds for tipping and are pleased to report that to date best results have been obtained from the use of 'Stellite' Welding Compound."—**Canadian Linderman Co., Limited**

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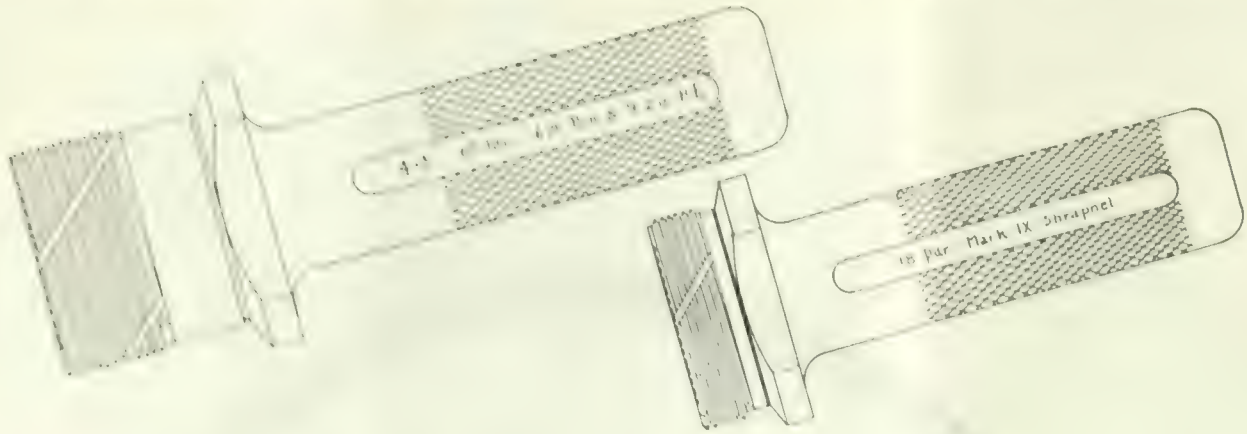
Head Office: DELORO, ONTARIO

TORONTO MONTREAL

FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

STEEL *for*

Shrapnel Shells and Shell Blanks

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Office:
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Western Sales Office:
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Steel Ingots
by the
HARMET
Liquid Process

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Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6" shells.

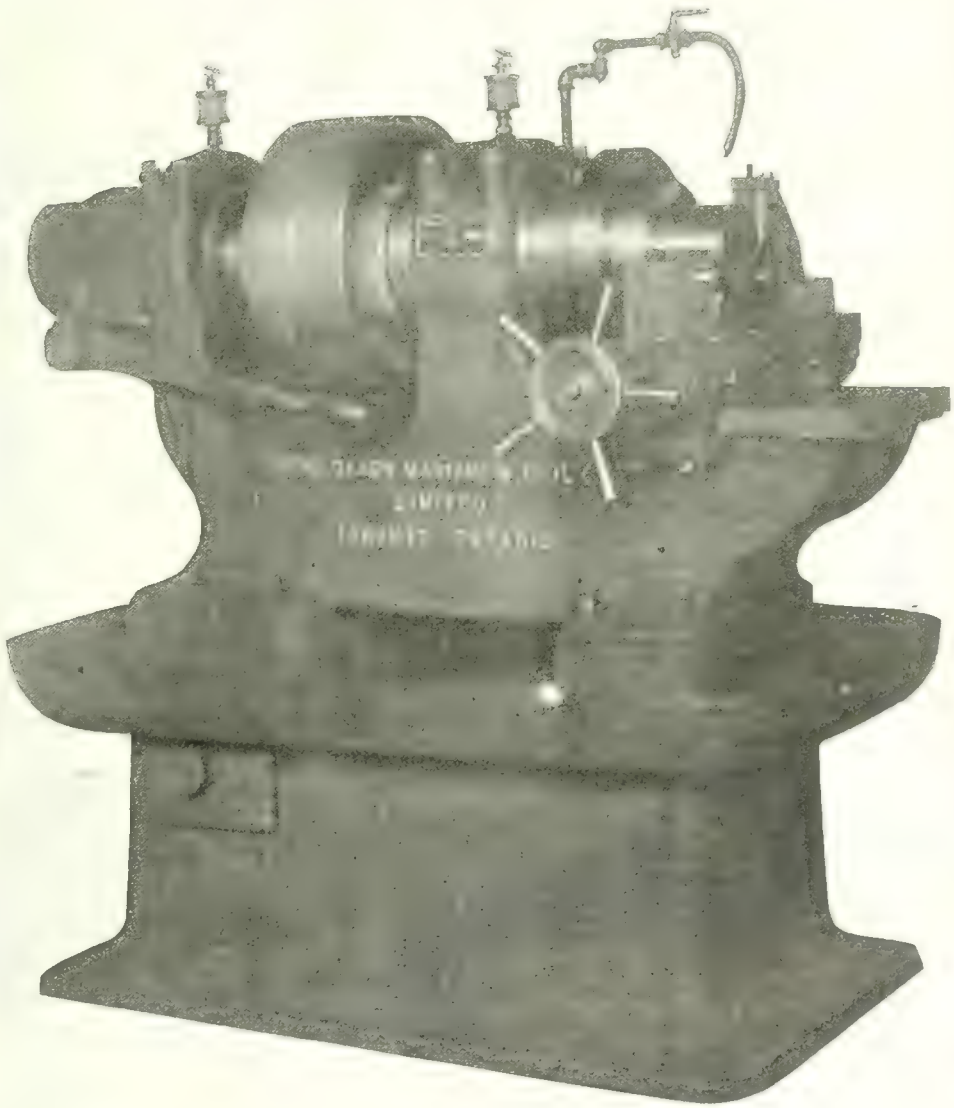
Roelofson Machine & Tool Co., Ltd.

Head Office 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6" shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



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GARLOCK-WALKER MACHINERY CO. LIMITED

32 FRONT ST WEST. **TORONTO** TELEPHONE MAIN 5346

EQUIPMENT FOR 75 mm AMERICAN / FRENCH / 18 pdr. BRITISH SHRAPNEL

FOR either complete outfit, or individual machines to balance equipment already installed, for any of the above shells.

FOR additional machines on any other size projectiles.

FOR Standard equipment – Engine Lathes, Turrets, Screw Machines Drills, etc.

FOR Good used machine tools.

SEE

GARLOCK-WALKER MACHINERY COMPANY, LIMITED

32-34 FRON STREET WEST, TORONTO, ONTARIO

METAL and WOODWORKING MACHINERY of all Kinds

Decidedly Quality

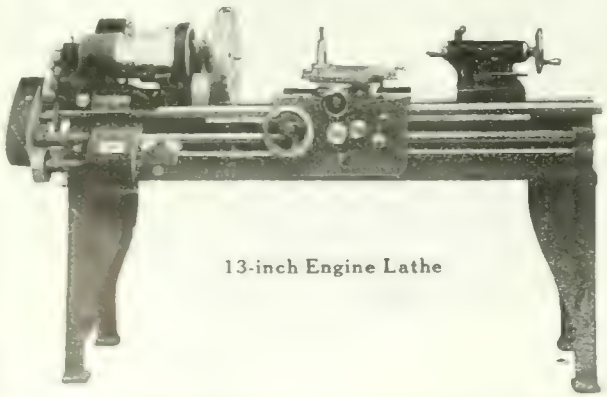
That is the verdict of our clients.

In construction, operation and results, quality is evident. That is the reason why Filsmith has occupied the foreground in lathedom. In Canada and United Staes you will find Filsmith quality is based on what it is now doing, not on history. Full webbed headstock, 50-point carbon steel spindle, and rigidly clamped tailstock.

An enquiry will secure you full information.

THE PHILIP SMITH MFG. CO.

SIDNEY, OHIO, U.S.A.



13-inch Engine Lathe

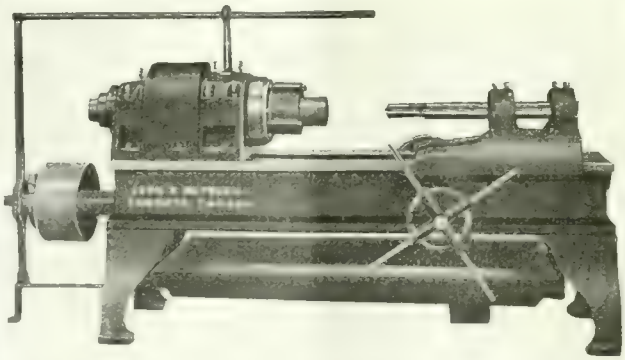
Boring 6" Shells

with

Perfectly accurate boring and far greater speed go into your shop the day you open the door to a Hepburn Single Bar Boring Lathe of rigid build. No lathe in your shop or any shop other than a Hepburn Lathe is its equal on 6" shell work. Write for its record.

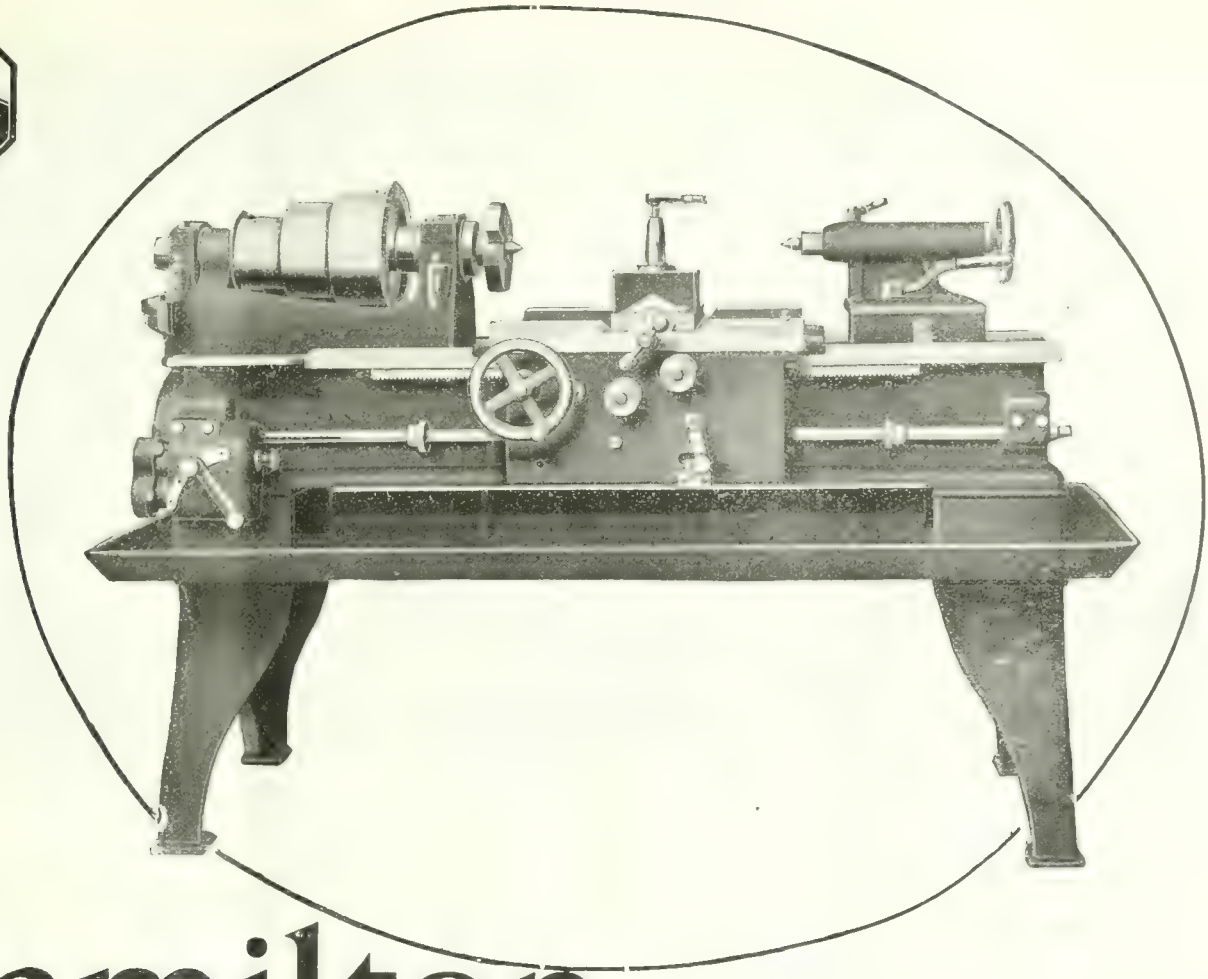
Your old lathe rebuilt by us will be as efficient as new for all lathe work. Ask for particulars.

Hepburn Lathes



John T. Hepburn, Limited

18-60 Van Horne Street Toronto, Ontario



Hamilton Lathes

Equipped with a complete range of feeds with quick changes. Automatic Stop and other Hamilton features which make it an indispensable lathe for the shop in need of a speedy, cost-cutting, efficient machine.

Its simplicity of design to ensure ease of operation is a big factor in favor of this lathe.

For long runs on duplicate pieces we highly recommend this New Hamilton Lathe, built for plain turning, boring, etc. This machine meets the popular demand for a single-purpose machine for automobile and manufacturing of a like nature.

They can be converted and adapted to a wide range of operations by equipping with back gears, screw-cutting mechanism, etc. 14, 16 and 18-inch sizes. Bulletin with full descriptions on request.

Ask to-day.

The Hamilton Machine Tool Co., Hamilton, Ohio

Sole Agents for Ontario: H. W. Petrie, Limited, Toronto, Ontario

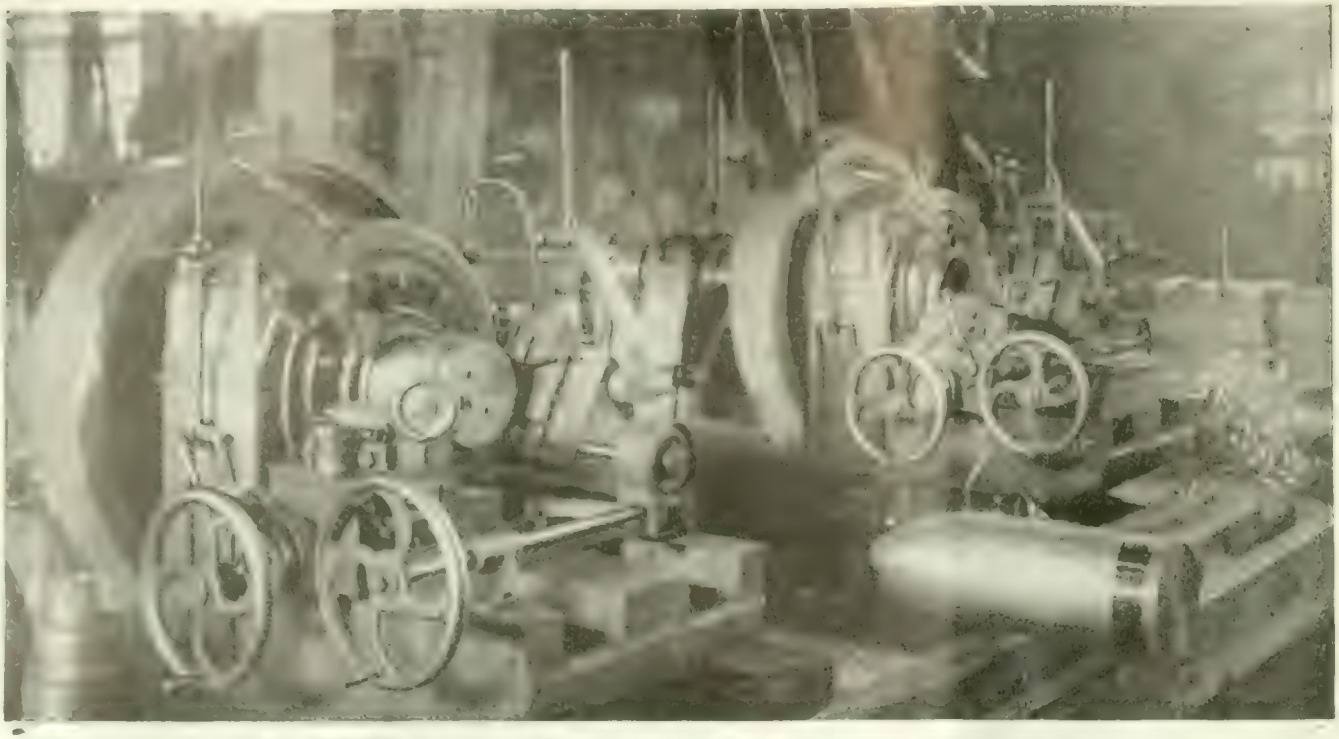
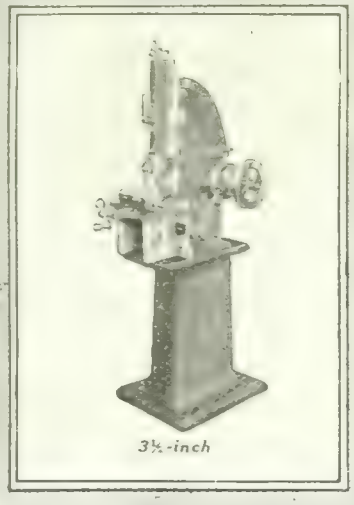


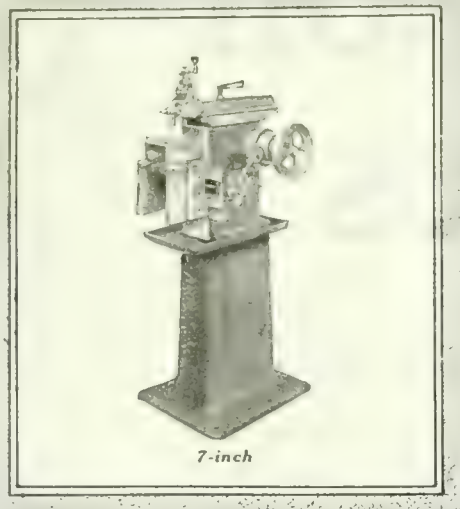
Photo shows two of our Band Turning Machines in one of the largest shell shops in Canada.

These machines are built for turning bands on 8", 9.2" and 12" shells. They are giving perfect satisfaction in several of the largest 9.2" shops in Canada. Let us put you in touch with some of them. **Write for full particulars and price.**

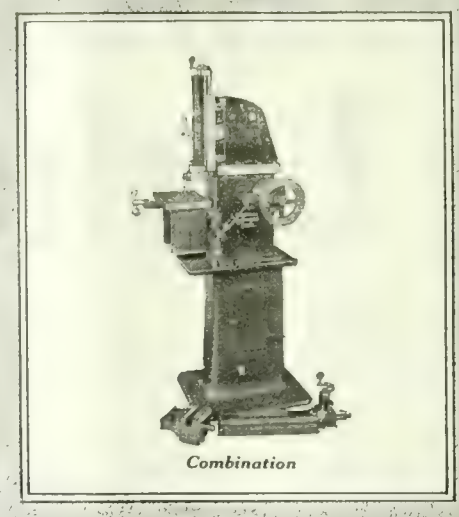
Bennett Ave. **Warden King Limited** Maisonneuve, P.Q.



3½-inch



7-inch



Combination

Three of the machines that by their cost-reducing features have established themselves "solid" with the home users and by these same merits are reaching out in foreign countries. A silent, but powerful message of the Rhodes efficiency.

Their capacity is greatly promoted by the adjustments which may easily and quickly be attached. For shaping, slotting, die making, tool making, etc., these machines stand paramount. An inquiry on your stationery will receive prompt attention.

The Rhodes Mfg. Company

Hartford, Conn., U. S. A.

TEXTILE BELTING and PACKINGS

HIGH SPEED TWIST DRILLS

J. R. BAXTER & COMPANY LIMITED MONTREAL

and GENERAL MACHINERY SUPPLIES

Two Cuts at One Time

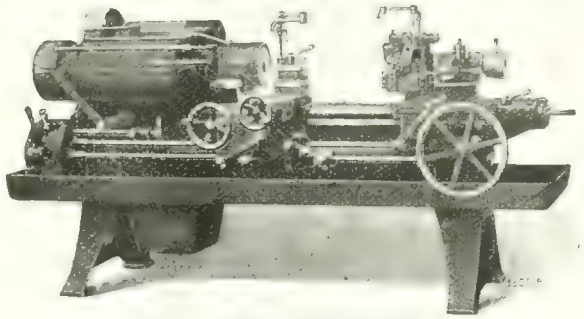
The ability to face, undercut or neck with the square turret while boring or turning with the hollow-hexagon turret contributes largely to the time-saving and economical output of the

Universal Hollow-Hexagon Turret Lathes

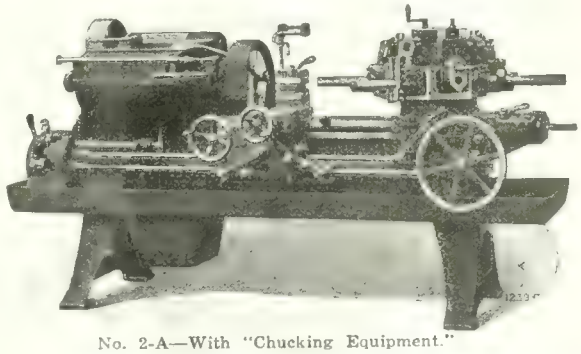
Separate feed shafts, each with ten individual feeds, operate the carriage and turret saddle independently, and provide the exact feed required for each.

And to this great advantage are added the other essentials for rapid and accurate production—excess power, extreme rigidity, great adaptability, and a power rapid traverse that saves time and conserves the energy of the operator.

Without obligation, ask us to show the saving on one of your typical jobs. Send blueprints with rough and finished samples.



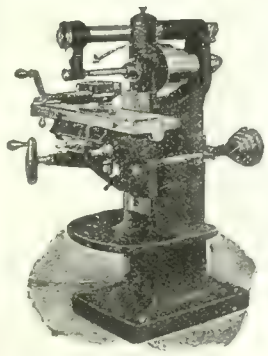
No. 2-A—With "Bar Equipment."



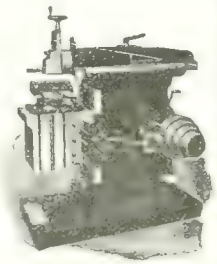
No. 2-A—With "Chucking Equipment."

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal, Benson Bros., Sydney and Melbourne, Australia; A. Asher Smith, Sydney, Australia



CUT YOUR SHOP COSTS



Nobody would think of putting 16-inch lathe work on a 30-inch lathe, then why leave small parts on a large Milling Machine?

A Steptoe Hand Miller or small power feed can be handled quickly and will cut your production cost. You will have less money invested in your Milling Machines and have more machines to do the work.

That same principle applied to your small planer work will cut the cost of planer work.

A Steptoe Shaper will do the work faster because it can be handled quicker.

The John Steptoe Company, CUMMINSVILLE CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.

A time saver
Can you beat it?

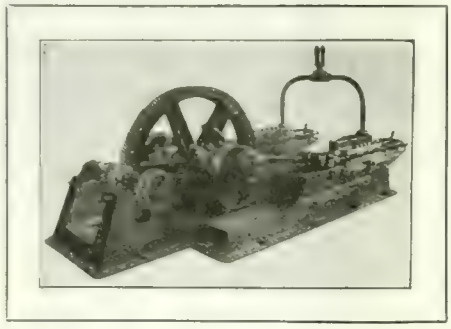
HAVE you noticed the Consolidated Clamp Connection on all Consolidated Presses, grips like a vise and stays put, one of the bull-dog kind, which, when properly tightened, will not break away, or slip.

If you break it we will furnish a new one free of charge.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver



ELMES

18" Stroke Hydraulic Pump

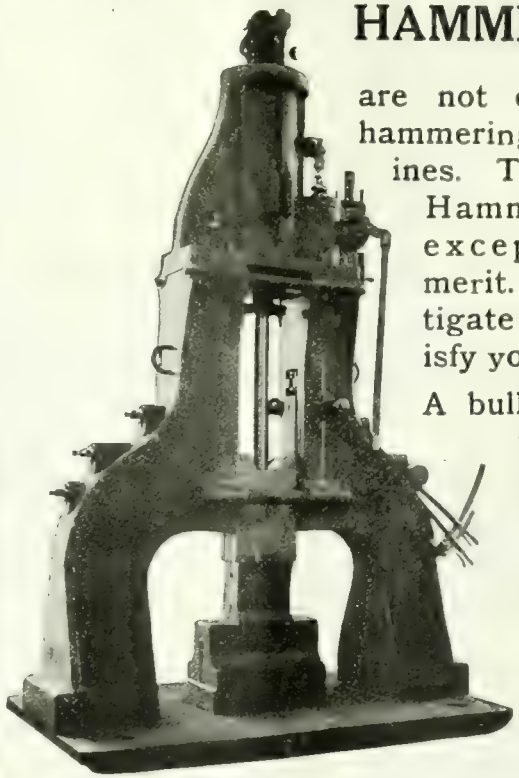
for maximum pressures and capacities, for 250 horse power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY

ERIE, PENNSYLVANIA, U. S. A.

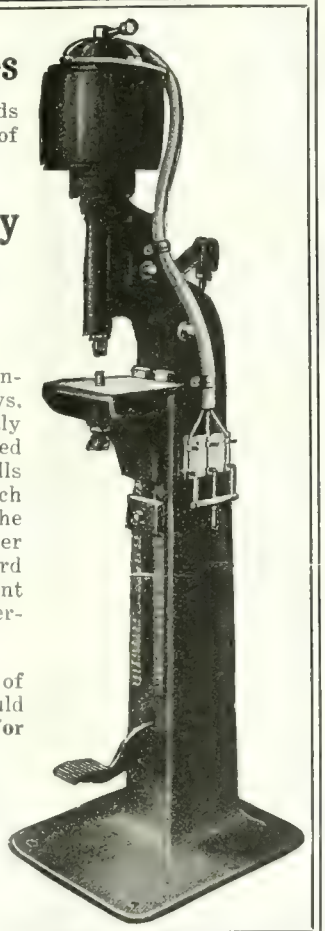
A Woman Operates

this noiseless riveter. She feeds the work to it with the ease of rocking a cradle.

The Grant Rotary Rivet Spinning Machine

is the **no**-nerve-racking way. Instead of by hammering blows, the rivet shank is silently swedged into the form desired by specially shaped twin rolls revolving independently of each other at the lower end of the revolving spindle. Whether rivets are soft brass or hard steel, the shanks are never bent and the heads are finished perfectly smooth.

One firm reports a saving of $4,368 annually. You should investigate to-day. **Write for catalogue.**



GRANT MFG. & MACHINE CO.
HOLLAND AVE.
BRIDGEPORT, CONN.

Labor Saving Devices

Waiting Your Request

Is the M.E.C. illustrated catalog. It describes minutely the most dependable labor-saving devices including these deservedly famed

M E C Air Cylinders, Air-Operated 2 and 3 Jaw Chucks, M.E.C. Master Hinge Collet Chucks and Collapsible Taps.

In your hands it will point the better way to compensate for any shortage of skilled labor with which you may be contending. Write to-day for your copy.

MANUFACTURERS EQUIPMENT COMPANY
175-179 N. JEFFERSON STREET, CHICAGO, ILL.

Canadian Agents: J. R. Stone Tool and Supply Co., Detroit, Mich.
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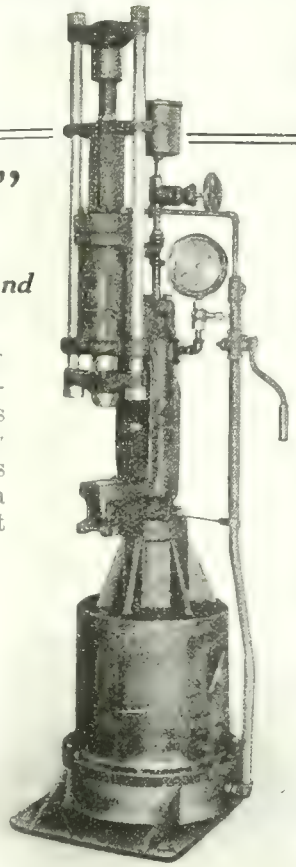
Triple Purpose "METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.
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DETROIT, MICH.
U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

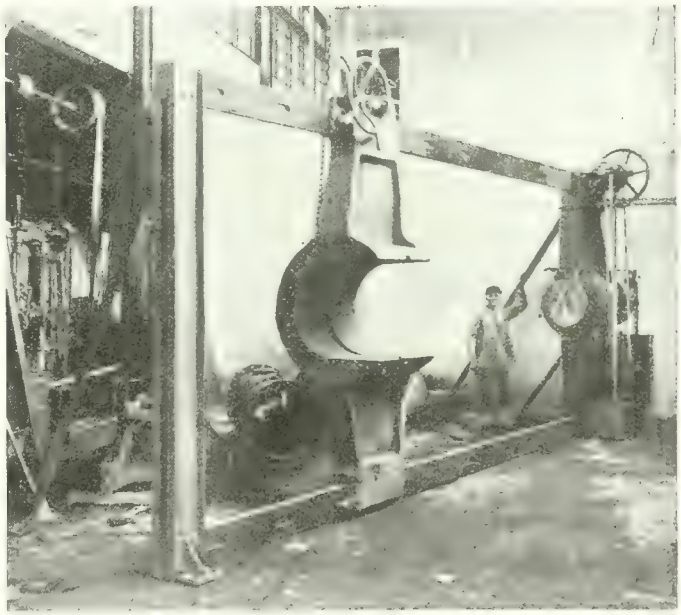

Illustration shows Hydraulic Press for Government Shipbuilding Plant, Sorel, Que.

Hydraulic Presses, Pumps and Accumulators for all Purposes.

Write for Prices and Deliveries.

WM. R. PERRIN, LIMITED
TORONTO, CANADA.

LET STARRETT TESTS PICK YOUR BLADE

Hack saw tests are important; they save blades, and the mechanic's valuable time. Every-day experience proves this.

Two mechanics were comparing their abilities:

One said that he could cut machinery steel four times as fast as the other.

The challenge was accepted. The challenger snapped a blade into his frame and set to work. But the other turned to the hack-saw rack. Before he had made up his mind to use a given blade, his friend had cut an inch into the steel—but he was changing his dulled blade. Because of breakage and dulling, the blade was replaced five times, while the man who tested and picked the

Starrett Hack Saw

suited to the work had cut the bar four times.

The facts of this story are vouched for.

Moral—It pays to pick the right blade. It pays to test hack saw blades. But we have done the testing for you, to save your time. Our Catalog No. 213 tells you what Starrett Hack Saw to use on the job.

Starrett Hack Saws are unexcelled, just as Starrett Fine Tools are unexcelled.

STARRETT HACK SAWS

The L. S. Starrett Company

THE WORLD'S GREATEST TOOL MAKERS

ATHOL, MASS.

NEW YORK LONDON CHICAGO

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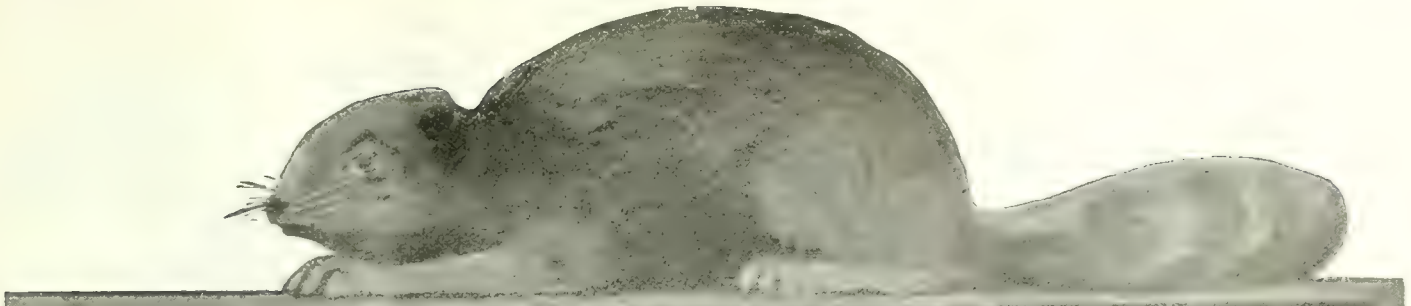

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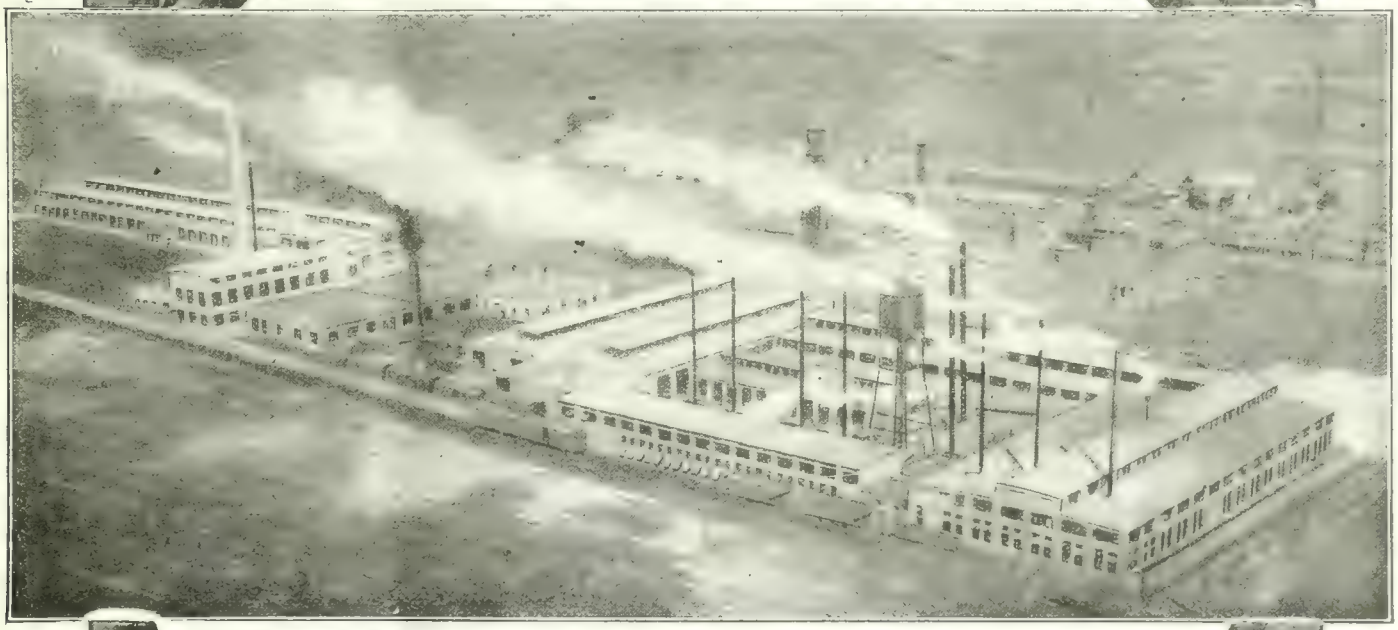
BEAVER BRAND METALS

BRASS BRONZE
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada

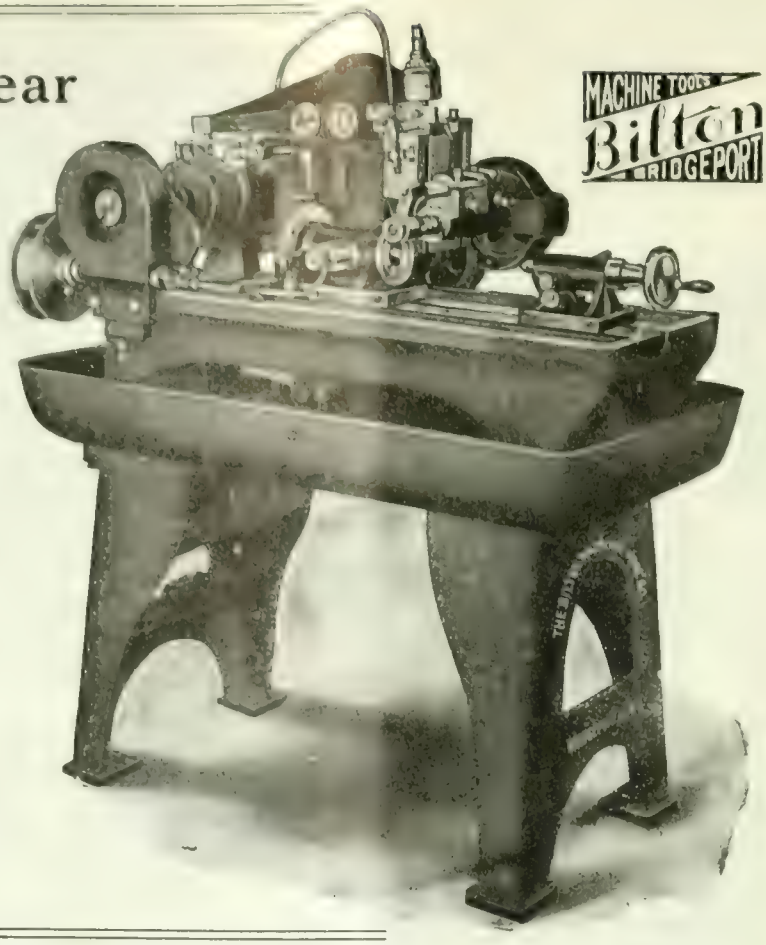
COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

Bilton Automatic Gear Millers—Spur or Bevel Gears

CAPACITY

No. 1 — 24 Pitch
No. 2 — 10 Pitch
No. 3 — 8 Pitch



The Bilton Machine Tool Company

Succeeding The Standard Mfg. Company
Housatonic Ave., Bridgeport, Conn., U.S.A.

Also Manufacturers of
Plain Horizontal Millers
Automatic Millers
Plain and Ball Bearing
Bench and Column Drills
Milling Cutters
Riveting Machines

Catalog 30 on request

Foreign Agents:
Alfred Herbert, Limited
M. Mett Engineering Company
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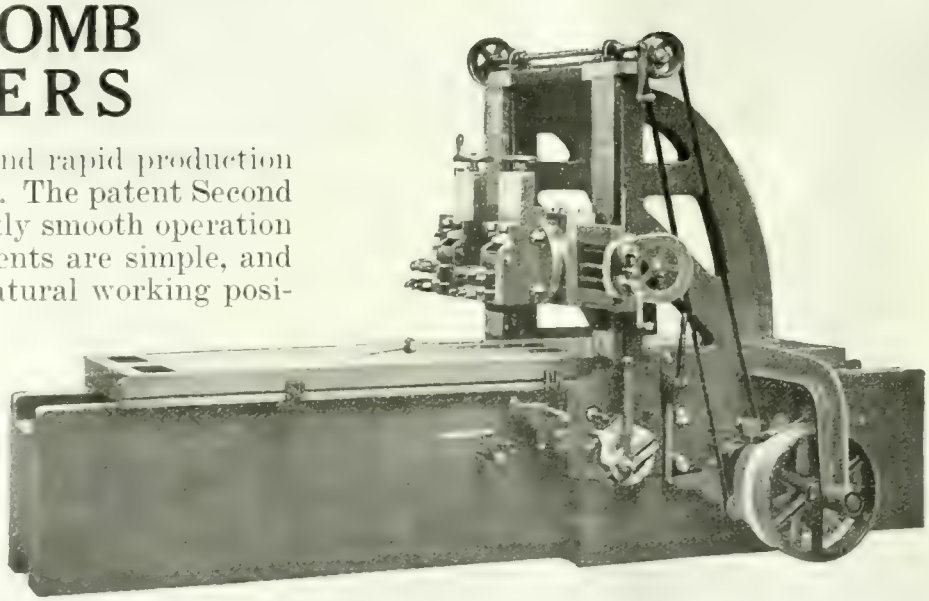
Powerful, Sturdy and Productive

The ability to run without shock or injurious vibration under heavy driving has placed

WHITCOMB PLANERS

in the lead for accuracy and rapid production over a wide range of work. The patent Second Belt Drive insures perfectly smooth operation at all times. All adjustments are simple, and quickly made from the natural working position of the operator.



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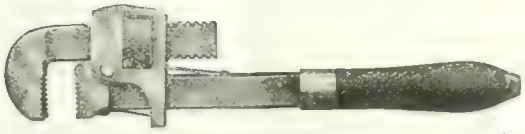
Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass. *ENGINE LATHES METAL PLANERS*

"W & B" Pipe Wrenches the Only Pipe Wrenches

MADE IN CANADA

The line comprises all sizes from 6 to 48 inches



"W & B" Wood Handle Grips. Length open 6 to 14 inches

"W & B" STEEL Handle Grips. Length open 18 to 48 inches.

These Wrenches are extra strong frames well proportioned.

The Jaws are Drop Forged and tempered, giving them strength to resist the most severe strains.

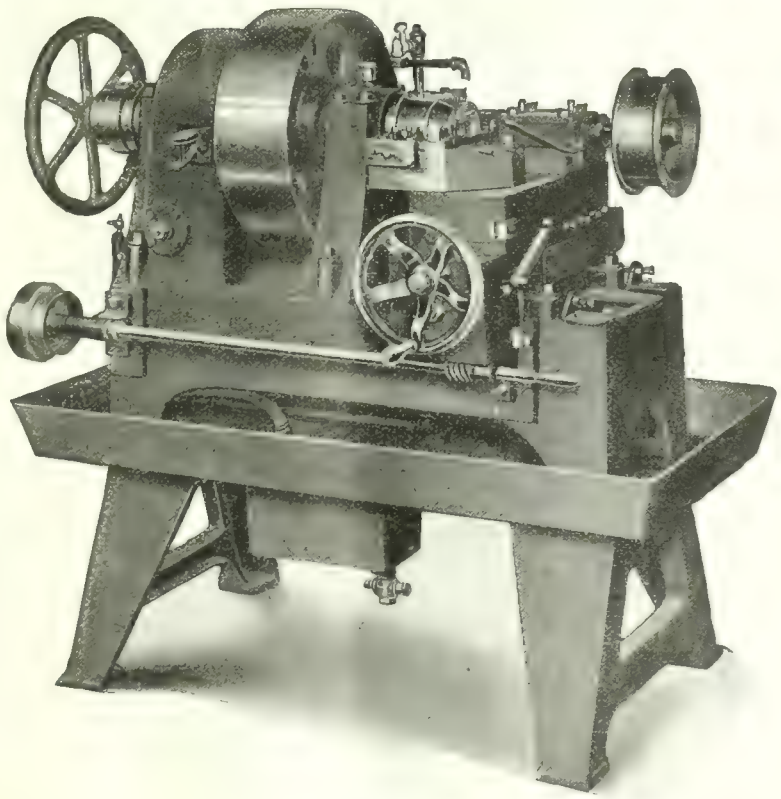
Other patterns of "W & B" SCREW WRENCHES MADE IN CANADA at our St. Catharines factory, are our Machinists' Knife Handle, "Railroad Special," Regular (Agricultural Pattern). Adopt this established line as your standard CANADIAN-MADE WRENCHES.

Complete information and catalog No. 90 on request.

The Whitman & Barnes Manufacturing Company

ESTABLISHED 64 YEARS

ST. CATHARINES, ONT.



For Turning, Facing and Milling the thread on Gas Check Plugs for 6-inch High Explosive Shells.

THE BANFIELD PLUG MILLER

Patented in Canada and United States

THIS machine is especially designed for finishing base plugs, turning the outside diameter, finishing the face with any camber desired, and milling the thread, all in one chucking, the complete plug being finished in six minutes by unskilled labor.

The machine is equipped with quick draw-in collet. Drive pulley 18" x 6", with bronze bush having cut jaw clutch for turning and facing. Worm gear 100 to 1 ratio, with cut jaw clutch for milling, driven by 10" x 1½" flanged pulley. The milling cutter is driven by an 8" x 2½" flanged pulley. Tool post carriage is equipped with power feed (two speeds) having automatic stop. Power feed pump with relief valve driven from worm shaft (all drives direct from main line shaft). Rigidly built, simple and economical to operate.

Weight 1,800 lbs.

For 18 pdr., 4.5 and 60 pdr. High Explosive Shells. Can furnish machines of same type, but somewhat lighter in construction. Particulars on request. These machines are tooled up for finishing plain machined or bevelled plugs, if desired.

Write for prices and deliveries.

Prompt Shipment

BUILT EXCLUSIVELY BY

Edwin J. Banfield

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KEMPSMITH

UNIVERSAL MILLING MACHINES

Every Kempsmith Milling Machine of whatever size is provided with a slotted spindle nut for positive driving of arbor and for quick adjustment of the cutter in either direction.

Every machine is equipped with our patented lever overhanging arm which insures positive alignment of arbor and boring bar and also prevents the overhanging projection of the under cut.

Kempsmith machines are heavy, with weight well distributed and their accuracy is guaranteed within very close limits.

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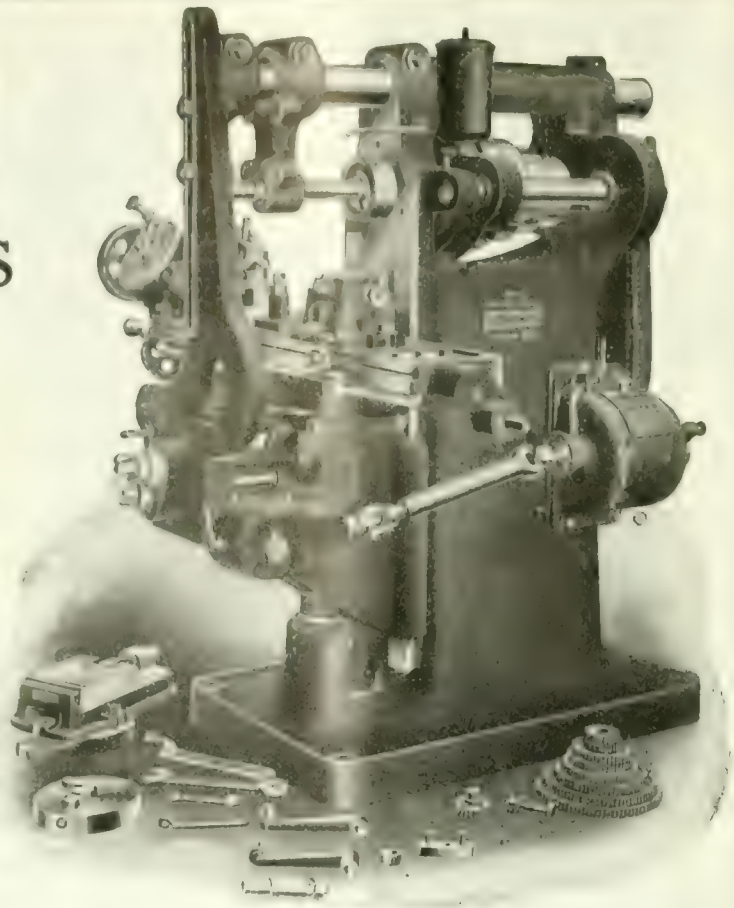

Kempsmith Manufacturing Co.
MILWAUKEE, WIS., U.S.A.

AGENTS:
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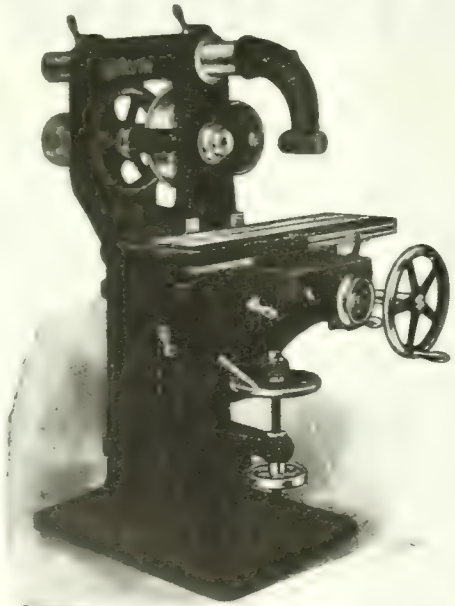
GARVIN No. 21 Plain Miller

Back Geared



No. 21 B.G. PLAIN MILLING MACHINE
Back Geared
Use Code - Abject

For Plain and Gang Milling for general manufacturing, and is used mostly in gangs of 5 or 6 machines to one operator. Spindle runs in adjustable bronze boxes, and is driven by a 3" belt through back gears (3 to 1).

Knee is our improved solid top design, rigid and stiff to resist side pressure of heavy cuts.

DIMENSIONS:

Automatic Feed at Table	18 in.
Adjustment in line with Spindle	6 in.
Vertical adjustment under Spindle	13 in.
Table, inside Oil Pockets	6 x 10 in.
Changes of Speed	6
Changes of Feed	6
Net Weight, Skidded	1,575 lbs.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

IMMEDIATE SHIPMENT

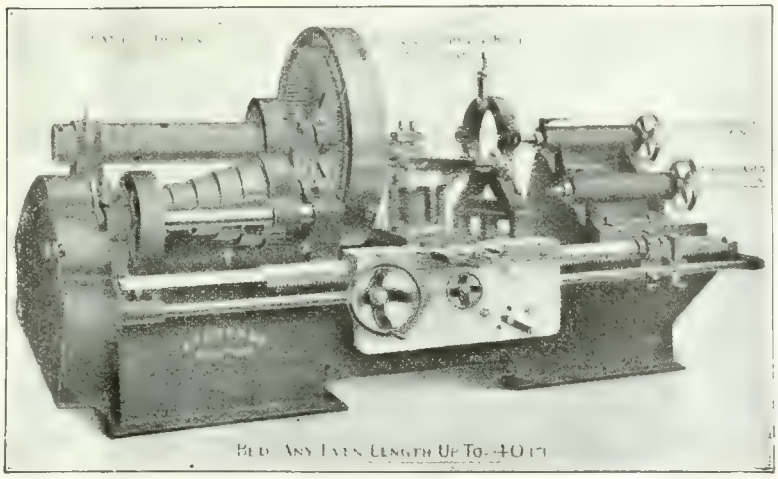
30-ft. BED

McCabe 2-in-1 Lathe

26 and 48-INCH SWING

TRIPLE-GEARED—RATIO 72 to 1

J. J. McCabe, 149 Broadway, New York



Showing McCabe's Latest Heavy Type "2-in-1" Double-Spindle Lathe—26, 48-in. Swing.

48-in. Swing. Triple Geared ratio 72 to 1.

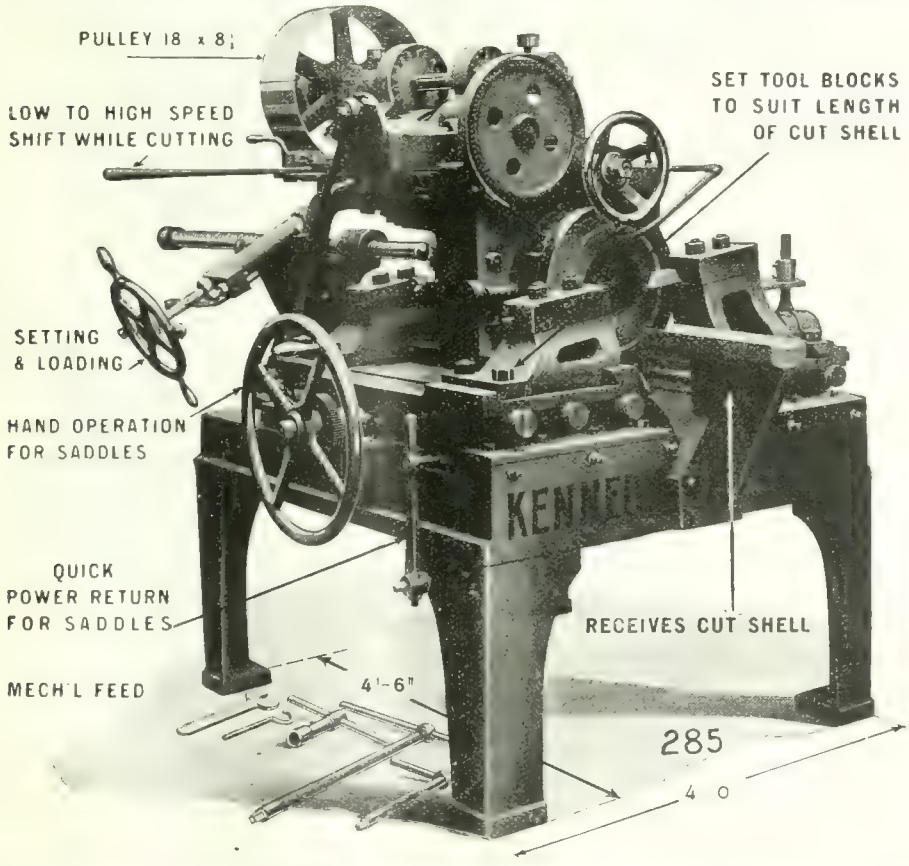
26-in Swing. Back geared.

Turns between centers 24 ft.

Swing over carriage on 48-in. Lathe is 40 in.

Prominent shipbuilders are using McCabe Lathes on long beds.

Thousands in operation all over the world.



CUTTING-OFF MACHINES

Cuts both ends at once

except 8 in. and 9 in. sizes which cut one end only

Forgings load in one end and discharge out the other when cut

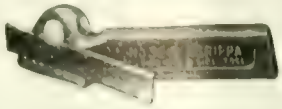
A Girl can operate it

New quick power return for saddles

DELIVERIES REASONABLE

The Wm. Kennedy & Sons, Limited

Owen Sound



WILLIAMS "AGRIPPA"
TOOL HOLDERS
Headless Cam
Hex Head Cam
"THE HOLDERS THAT HOLD"

save the most time and need the least shifting

We will ship them promptly if your dealer can't supply you from stock

J. H. WILLIAMS & CO.
THE WRENCH PEOPLE
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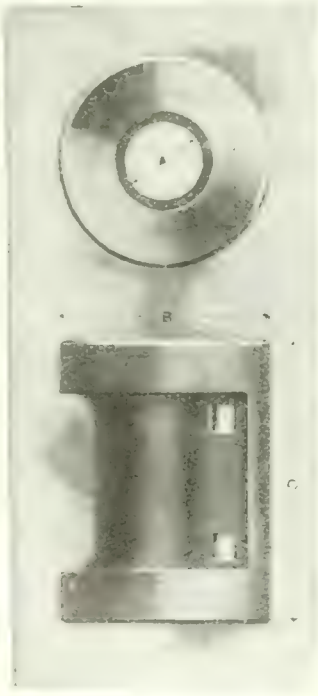
Mining Machinery Parts



Two-key Tappet

Shoes and Dies, Tappets, Bosses, Cams and Stamp Heads

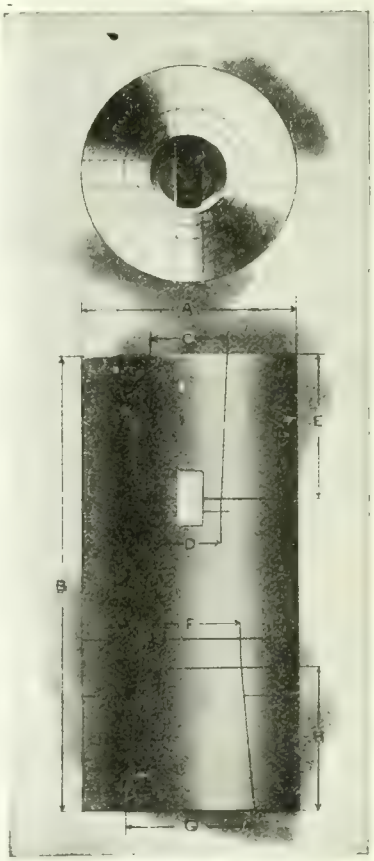
Also Manufacturers of Lining Plates for Ball and Tube Mills Concaves and Heads for Gyratory Crushers.

Machine Moulded Gears

Any size up to 18 feet in diameter. No patterns needed.

Send Us Your Specifications, We Do the Rest. Write—

Hull Iron & Steel Foundries, Limited
HULL, P.Q.



Stamp Head

INDUSTRIAL CARS

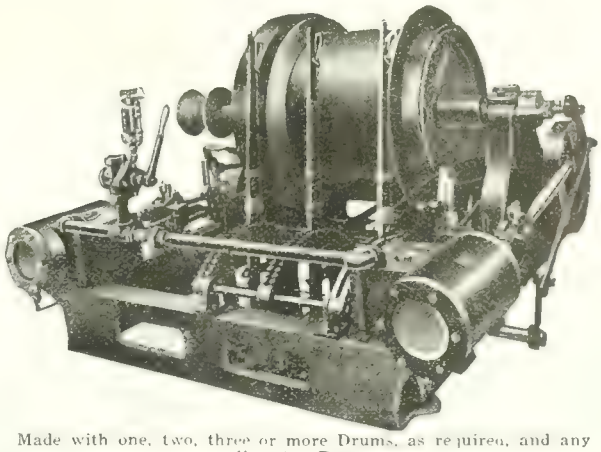
of the right kind for your work, and

BELT HOISTS

to move them rapidly

Reduce Overhead Charges

That is why so many Canadian Factories are being equipped by us with Belt Hoists and small cars — Because they reduce operating expenses, and handle materials much quicker than by the older methods.



Made with one, two, three or more Drums, as required, and any diameter Drum.

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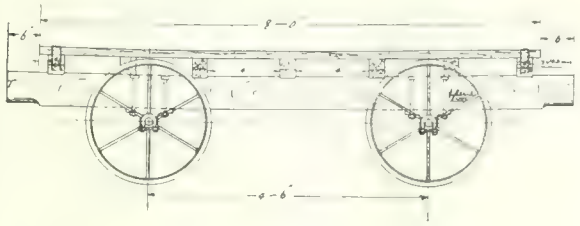

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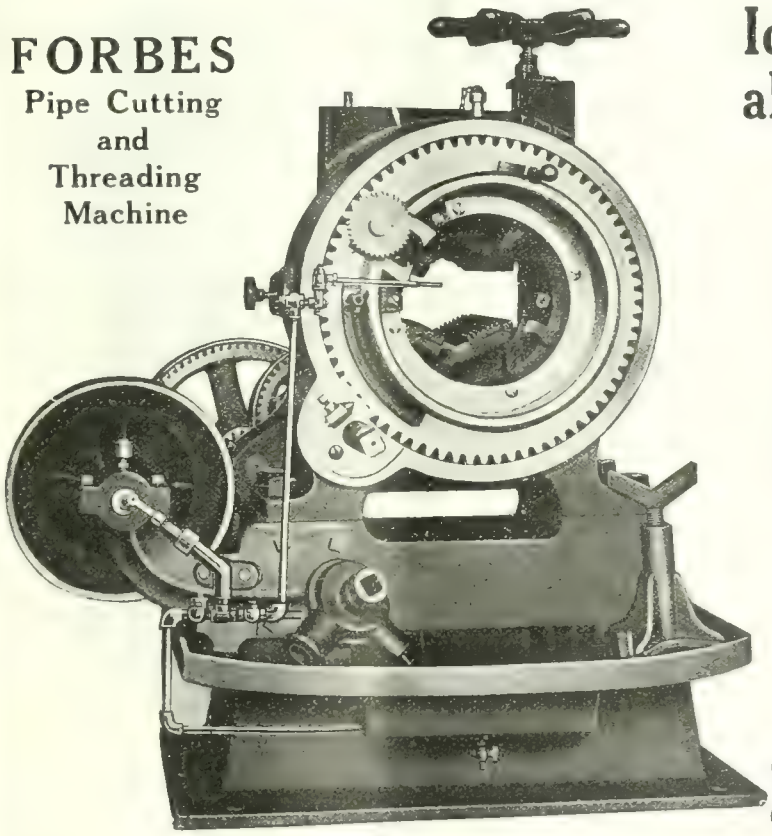

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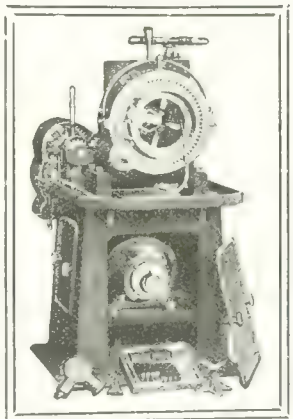

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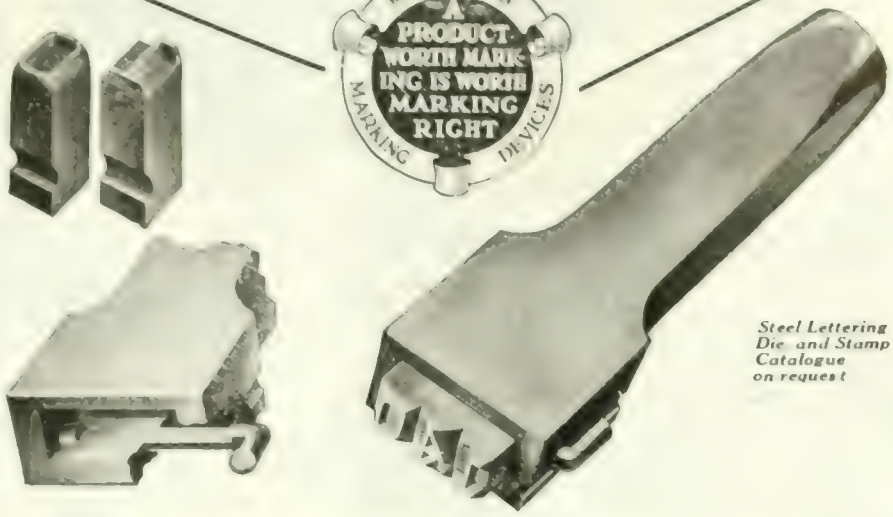

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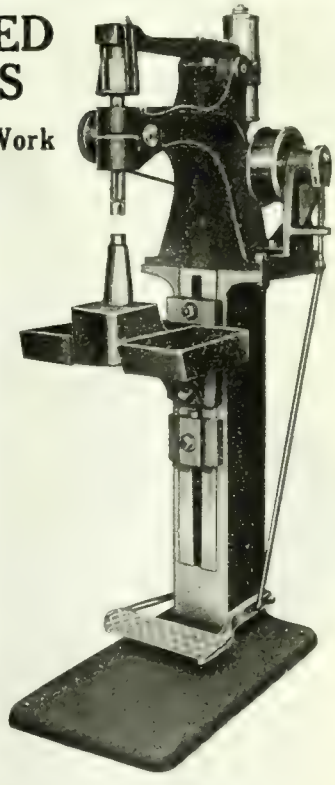

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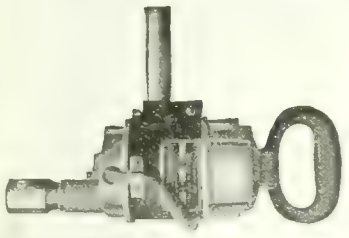

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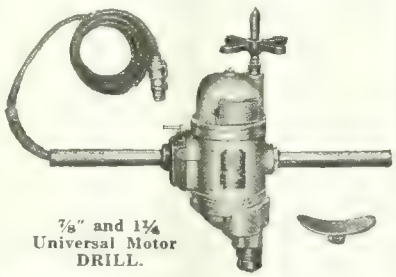

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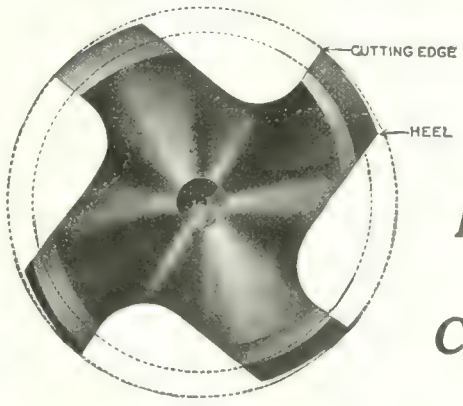

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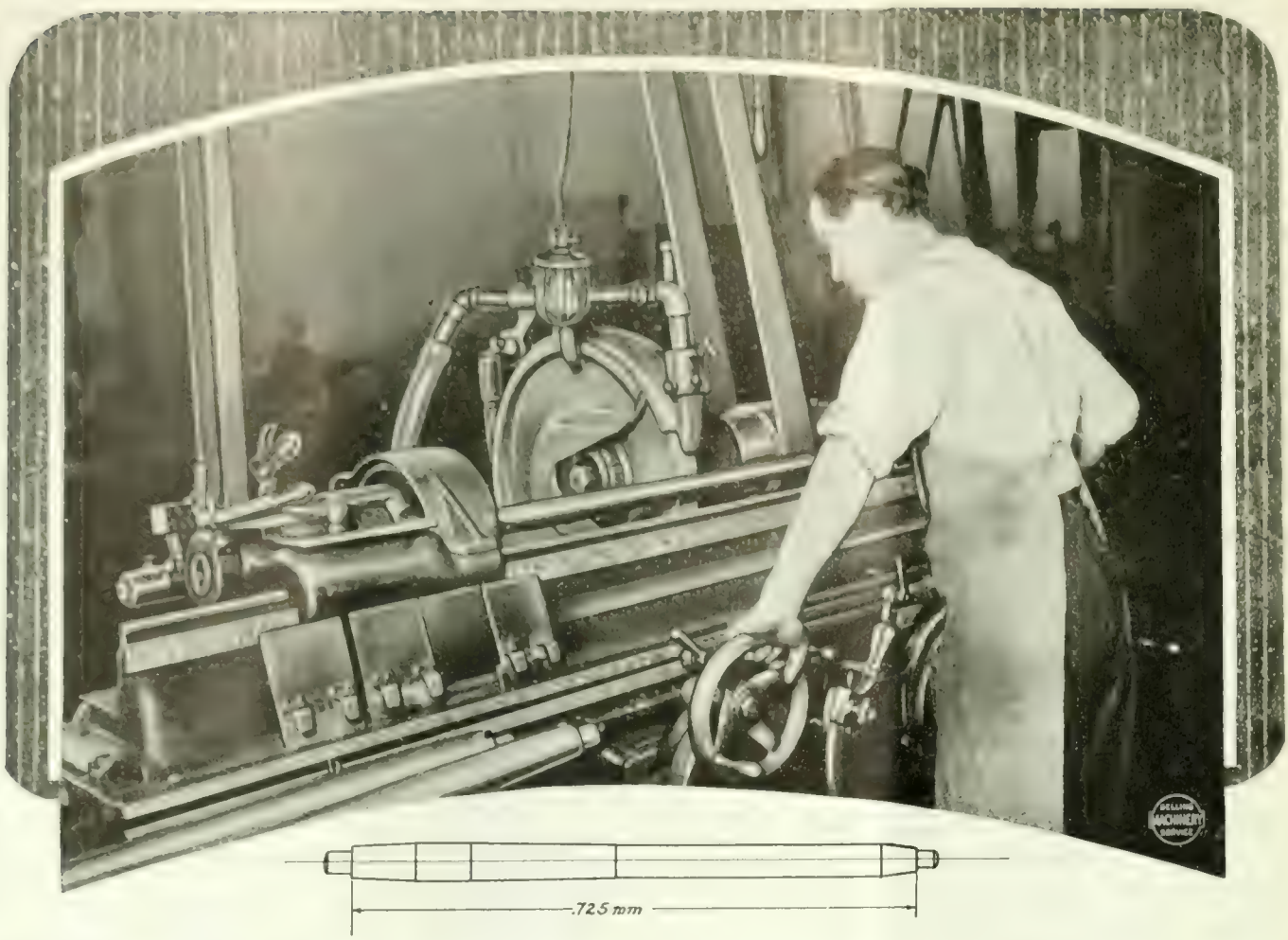

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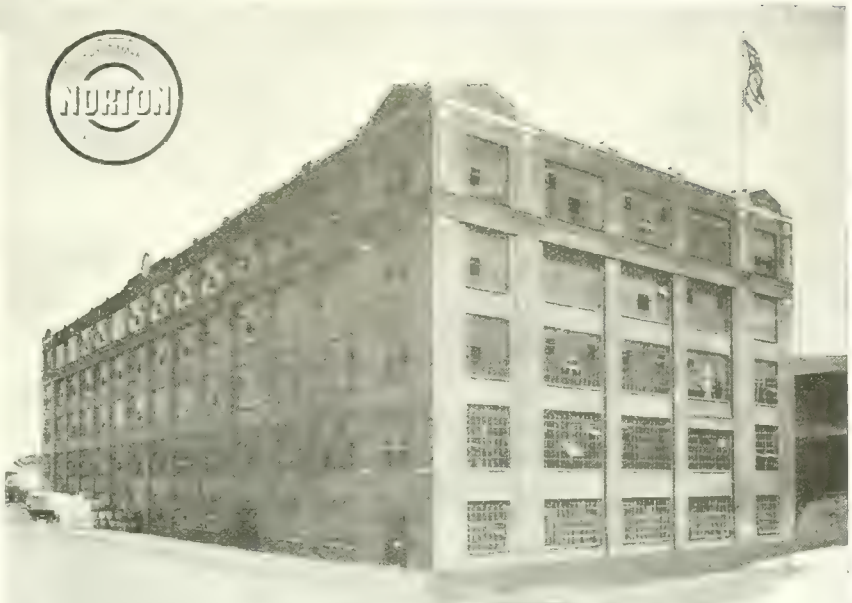

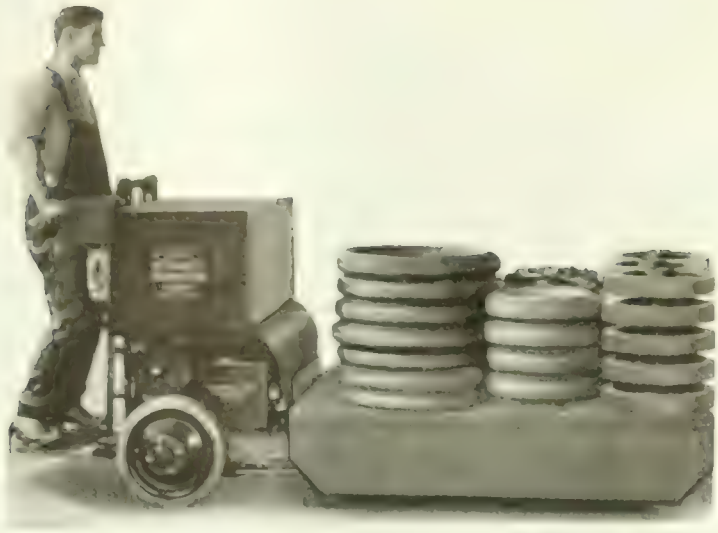

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Fuel Economy Possibilities in Brass Melting Furnaces*

By L. C. Harvey

Developments in the production of ships' fittings and similar equipment have resulted in greatly increased use of brass in various forms. Despite the urgency of the demand, the cost of production warrants close attention to all opportunities for economy, and the experiences of the author are thereby of more than passing interest at this time.

FUEL economy is a very engrossing proposition, and one in regard to which it is to be hoped that the future will furnish ideas and methods that will make past efforts in this direction appear very primitive and inefficacious.

Let us consider, first of all, the amount of coal mined in the world for one year, and the possible extent of the wastage of that year's supply of coal. For 1910 the amount was about 1,300,000,000 tons, and it is improbable that anything like 5 per cent. of this fuel was ever turned into actual useful work. This means that 1,235,000,000 tons of coal were mined only to be wasted in heat radiation and other losses; this represents enough fuel to melt and superheat 2,500,000,000 tons of brass to 10 per cent. above its melting temperature.

Until petroleum becomes available in bountiful quantities, and its price in consequence is brought down to reasonable limits, the only fuel to consider is coal. Now coal should be used as mined, in the furnaces direct, or in gas-producers adjacent to the furnaces. The process of coking the coal is only a means to obtain a clean, smokeless fuel, of intense heat value, at the expense of considerable wastage during this costly process of coke manufacture.

Scope of Paper.

This paper has been written in the hope of encouraging progress in the direction of economy in fuel. It relates only in a very superficial degree to the quantities of fuel used in the melting of brass, but it is hoped that the points brought out will be accepted as of such national importance—apart from individual interest—that close investigation will be made generally into fuel consumptions in brass foundries.

Considerable quantities of copper, brass and bronze used for gun-mountings, heavy plate, stern tube liners, propellers and other products are melted in reverberatory furnaces, chiefly for the reason that very heavy castings are required; but these furnaces consume several times the amount of fuel that would be used to melt the same amount of metal in crucible furnaces. Reverberatory furnaces are, therefore, greater fuel wasters even than crucible furnaces, which are themselves extremely inefficient. It is not an uncommon occurrence for a reverberatory furnace to burn twice as much fuel per ton of metal melted as the quantity that would be used in the usual types of crucible pit furnaces, and six times the amount of fuel required for tilting furnaces.

The amount of metal melted and the weight of fuel used in these reverberatory furnaces have not, however, been taken into account in this paper, so that the estimates I mention refer only to crucible melting plants. It is quite impossible for anyone to give exact figures for tonnage output of metals melted in crucibles under the present conditions without full access to Government and trade statistics, but it can be definitely accepted that whereas the assumed figure for the quantity of brass melted in this country during 1916 is one that probably falls a good way short of the real collective output of the brass foundry trade, the deductions arrived at in regard to fuel used are under-estimations.

I have been closely associated with melting and casting-shop practice for many years, and on behalf of the Morgan Crucible Company have been privileged to design the crucible melting plants supplied to most of the large Government and private undertakings which have been instrumental in producing the enormous quantities of metal—notably brass for fuse rod and cartridge strip—that have been required by the Government during the past three years. In order to keep a clear issue under consideration, the calculations given in this paper refer only to the melting of this class of metal.

Low Efficiency of Present Practice

Though much thought and ingenuity have been expended during recent years upon the equipment of coal-consuming plants with more efficient types of boilers, fuel economizers, mechanical stokers, feed-water heaters, etc., with one ultimate end—the saving of fuel—in the brass foundry, it is still the general practice to melt metals in small uneconomical coke-fired crucible furnaces of the pit type, having heat efficiencies of only 2 per cent. to 6 per cent. This is the range of efficiency for the general type of coke-fired natural draught crucible brass-melting furnace, and unfortunately more often than not it falls to the lower figure.

Assuming, for sake of argument, that the output of brass for the above-mentioned purpose during the war rose to 2,000,000 tons in 1916 for Great Britain alone, the amount of coke required to melt this quantity of metal in small pit furnaces of 5 per cent. heat efficiency would have been 800,000 tons.

This presupposes that the coke has a calorific value of 12,960 British thermal units per pound, and that 261 British thermal units are required to melt brass of, say, 70:30 mixture and to superheat the alloy to 10 per cent. above its melting point.

In other words, the total amount of heat imparted to the metal would be 1,169,280,000,000 British thermal units, representing 41,714 tons of coke, which means that the balance of 758,286 tons of coke would be wasted in radiation and flue losses. This amount of useless fuel at 35s. per ton would cost £1,327,000, and the total amount of 800,000 tons £1,400,000.

The relatively large capacity crucible tilting furnace had fortunately been developed during the ten years previous to the outbreak of war, and very large plants of this type were immediately put down. So far was this the case that, taking into consideration the tilting furnaces existing prior to August, 1914, together with the new plants put down especially for war work, it can be accepted that of the quantity of brass mentioned —2,000,000 tons for 1916—one-third of this total was melted in tilting furnaces.

Now the average all-round working heat efficiency of the coke-fired crucible tilting furnace on 70:30 brass is about 15 per cent.

If, therefore, the whole of this assumed 2,000,000 tons of metal had been melted in tilting furnaces, the amount of fuel used would have been reduced to one-third, say, 266,666 tons of coke, of which the heat value of 41,714 tons would have been imparted to the metal and that of 224,952 tons of coke wasted in furnace and flue losses. In money this would mean £393,666 spent on useless fuel in tilting furnaces as against £1,327,000 in pit furnaces. Assuming that 2,000,000 tons of brass were cast in 1916, of which one-third was melted in tilting furnaces, these plants were responsible for saving the nation approximately 178,000 tons of coke, having a total value of £311,500.

This, however, is not the whole story, for the coke used in melting furnaces has to be made from coal, in which process there is a further wastage. Gases and volatile constituents which could be utilized in the melting chambers of furnaces are lost in the coke ovens. That "metallurgical" or "foundry" coke is necessary for cupola work is undisputable; but this high-grade fuel for brass melting is not essential if systems can be modernized and improved so that coal can be used direct instead of having first to convert it into coke.

This can be done in two ways, by the use of—

*A paper read before the Institute of Metals, London, September, 1917

The overall working efficiency of small gas-fired pit-type crucible furnaces is approximately the same as for the larger tilting type, and can be taken at 15 per cent. Assuming the calorific value of town gas to be 550 British thermal units per cubic foot, then 2,126,000,000 cub. ft. of gas would be required to melt and superheat the 2,000,000 tons of brass. In

TABLE I.—RELATIVE QUANTITIES OF COAL USED IN VARIOUS TYPES OF CRUCIBLE FURNACES.

Type of Furnace	Pit Furnace Metallurgical Coke	Tilting Furnace Metallurgical Coke	Tilting Furnace Gas-coke	Single Crucible Pit Furnace or Tilting Furnace Town gas	Multiple Crucible Pit Furnace, or Single Crucible Tilting Furnace Producer gas	Pit Furnace Oil	Tilting Furnace Oil
Fuel	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Heat efficiency	15%	15%	15%	15%	10%	5%	14%
Fuel required to melt and superheat 2,000,000 tons of brass	1,143,000	380,951	380,951	177,166 coal 106,000 coke 717,000 coke	1,371,832 coal	530,000	200,000
Fuel required to melt and superheat 1 ton of brass	1.143	0.381	0.381	0.177 coal 0.106 coke 0.717 coke	1.371 coal	135	19,700
Fuel required to melt and superheat 2,000,000 tons of brass	1.143	0.381	0.381	126,000,000 cu. ft	8,661,000,000 cu. ft.	26,497	26,497
Fuel required to melt and superheat 2,000,000 tons of brass	1,143,000	380,951	380,951	1,194,666 coal 717,000 coke	9,600,000,000 cu. ft.	503,503	175,303
Coal Values (Coke and Gas in Terms of Coal.)							
Tons of coal used for melting and superheating 2,000,000 tons of brass	1,143,000	380,951	266,666	177,166 coal 106,000 coke 717,000 coke	733,267	§805,633	§304,012
Tons of coal usefully employed*	400,000	133,333	41,714	177,166	70,960	.....	.....
Tons of coal wasted in heat radiation and flue losses	743,000	247,618	225,000	1,194,666	662,307	.....	.....
Ratio of coal used to coal usefully employed in melting and superheating 2,000,000 tons of brass	2.85 to 1	2.85 to 1	6.4 to 1	6.74 to 1	1 to 12	1 to 19	1 to 7
Coal equivalent of gas used in melting and superheating 2,000,000 tons of brass				717,000 coke	409,733	.....	.....
Coal equivalent of coke produced in melting and superheating 2,000,000 tons of brass	762,000	576,874	1,428,832	1,594,266			

*Allowing for losses in production of coke, etc. †Insufficient coke produced ‡Exclusive coke produced.
§Heat equivalent value of oil in terms of coal.

NOTE.—Figures given show the "gross" tons of coal used in the case of "town gas" include the by-products gas-coke, coal-tar, etc., the commercial value of which would be deducted before arriving at a final efficiency figure for this system of heat development and application.

ence where large plants are concerned, but it is not so readily applicable to the small foundry, and in any case there are producer losses which are absent in the first system. These losses, however, probably counterbalance the energy required to grind coal to the powdered state.

Powdered coal can be applied and burnt as readily as liquid fuel or gas, and it has many of the important advantages of these fuels in so far as running costs for crucibles, linings, labor, etc., are concerned. It is well known that these costs are much below those for coke-fired furnaces.

Referring again to the figures mentioned above, we will consider what this means in quantities and cost of coal, if used direct in powdered form.

For the 2,000,000 tons of brass, if melted in pit furnaces, 800,000 tons of "metallurgical" or "foundry" coke were required. In terms of coal this would mean about 1,143,000 tons of coal. On the other hand, if crucible tilting furnaces had been used entirely the overall amount of coal burnt as powdered coal, leaving the efficiency of the furnace still at 15 per cent., would have been approximately the same as the figure given for coke, viz., 266,666 tons, or a saving of 733,334 tons of coal for 1916, if the powdered coal system had been available. A very small amount of this gross saving of fuel would have been used in supplying air under a slight pressure for burning the powdered coal.

This, again, is still allowing for a relatively low furnace efficiency of 15 per cent., but it is inconceivable that in current generation and distribution. If the overall losses of steam and current generation, resistance losses in mains, etc., are taken into account, an efficiency of 50 per cent. in the electric-heated furnace drops down to about 10 per cent.

Use of Gas Fuel

During the past three or four years town gas has been very successfully employed in crucible melting furnaces from the standpoint of cleanliness, convenience, and especially life of crucibles, viewed from which this system has many important claims. But as a fuel economizer it has none. Let us briefly consider this question on similar lines to those followed in the case of coke furnaces.

TABLE II. APROXIMATE RELATIVE HEAT VALUES AND FLAME TEMPERATURES OF FUELS

	Heat Value of Cold Gas or Fuel	Theor. Max. Flame Temp. Air at 0 deg. C.	Theor. Max. Flame Temp. Air at 300 deg. C.
Coke pro. gas (B.T.U.)	(143 gross (136 net	1,600	1,700
Low-ct. soft coal gas	(148 gross (139 net	1,600	1,700
Mixed soft coal gas	(159 gross (145 net	1,530	1,630
Wood producer gas	(161 gross (153 net	1,600	1,700
Riche wood retort gas	(385 gross (349 net	1,860	1,990
Anthracite produc. gas	(173 gross (161 net	1,670	1,780
Water gas	(317 gross (294 net	2,030	2,160
Town gas	600 gross* (550 net*	2,000	2,100
	B.T.U. per lb.		
Metallurgical coke	12,960	2,090	2,250
Bituminous coal	14,000	1,990	2,160
Petroleum (water-free)	19,700	2,160	2,310

*Maximum values pre-war.

pit furnaces and tilting furnaces the total amount of gas burnt for this quantity of brass would have been 14,336,000,000 cub. ft.

In terms of coal, assuming 1 ton to yield 12,000 cub. ft. of gas, this would mean approximately for either the pit furnace or tilting furnace 177,166 tons used for useful purpose and for the production of 106,000 tons of gas coke, and 1,194,666 tons of coal wasted in heat radiation and flue losses, and production of 717,000 tons of gas coke. It will therefore be seen that, apart from leakage in the gas mains, which may be considerable, pit furnaces and tilting furnaces take a maximum quantity of 1,371,832 tons of coal as gas: 1,143,000 tons of new coal as coke (800,000 tons of coke), at a value of, say, £1,143,000 (taking coal at £1 per ton); or £1,400,000 as coke (at 35s. per ton).

On the other hand, tilting furnaces would take 380,951 tons of new coal as coke (266,666 tons of coke), at a value of £380,951, as against 1,371,832 tons of coal for making gas (60 per cent. gas-coke production would equal 823,300 tons of this by-product, which can be re-used in gas producers).

These costs, however, bear a more striking significance if they are considered in relation to the usual charge for gas at prices charged for town supply. Say this is 2s. per 1,000 cub. ft., then the cost alone for melting the 2,000,000 tons of brass would be £1,433,600.

The suggestion therefore arises that gas, if used, must be produced upon the site, and this brings us to the second proposition already mentioned—producer

gas. Producer gas cannot be economically generated for very small plants, but for the larger capacity melting furnaces, even when only one or two units are installed, the producer-gas system presents a very convenient arrangement; and I believe a simple and efficient producer for small melting plants will shortly appear upon the market. Assuming for sake of argument that producer gas had been used for melting the 2,000,000 tons of brass, the following figures show the approximate costs of this system.

Brass can be melted with a consumption of about 20 cub. ft. of 135 British thermal units gas per pound of brass in tilting furnaces, and with about the same consumption in multiple crucible pit furnaces (it is no use considering single crucible pit furnaces for low-power gas). For this producer gas 1 lb. of coal will yield, say, 60 cub. ft. of gas, so that the tonnage of coal required for pit and tilting furnaces would be about 666,607 tons, costing £666,607 for fuel alone to melt and superheat the brass, and 10 per cent. at least can be added for losses in the producer, which brings the coal consumption and value to 733,267 tons and £733,267. Thus we have a virtual saving of, roughly, 40 per cent. in quantity of coal, and 50 per cent. in cost of fuel when gas is made in producers instead of taken from the town mains.

Fuel Oil Applications

Fuel oil would have been very generally taken up had it been possible in past years to rely upon constant supply at a reasonable price; but it is fortunate for the nation that these doubtful factors prevented the wide adoption of this fuel. Shortage and ultimate discontinuance of supply would have been disastrous.

Up to some few years ago compressed air or steam had to be employed for efficiently pulverizing the relatively small quantities of oil for crucible furnaces. Compressed air is in every way preferable to steam as a means of pulverizing liquid fuel to be burnt in contact with plumbago crucibles, and it is especially so for high heat generation, but considerable power is necessary to drive the air compressor.

Some years ago I designed a low-pressure air-blast burner, which has now been fitted to some hundreds of crucible furnaces, and this gives just as satisfactory results as does the high-pressure system; yet this is not the ideal method, and it is hoped that it will not be long before a more efficient system of burning oil with natural-draught burners replaces all the old methods which employ compressed air, steam or forced draught.

It may therefore be interesting to complete this survey of fuel costs by the inclusion of those for fuel oil, but a figure bearing some relation to the prices taken for coal and coke must be assumed. Fuel oil has been quoted recently at 160s. per ton, but in order to bear some relation to coal and coke at the prices taken, the cost of oil must be reduced to, say, 80s. per ton.

The heat efficiencies of single crucible pit furnaces and tilting furnaces are, roughly, 5 per cent. and 14 per cent. respectively. Taking the calorific value of fuel oil at 19,700 British thermal units per pound, pit furnaces will require 530,000 tons at a cost of £2,120,000, and tilting furnaces 200,000 tons at a cost of

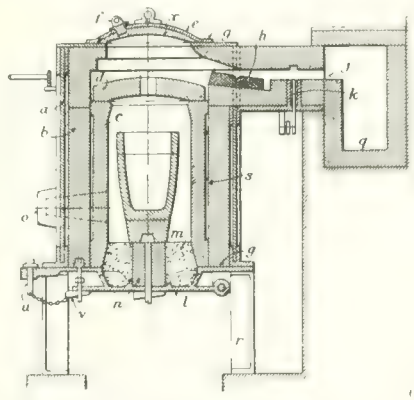


FIG. 1. SECTIONAL ELEVATION OF SUGGESTED FURNACE.

£800,000. Leaving out of account the small home production of fuel oil this large quantity of oil would have to be brought from abroad, and if used in pit furnaces 503,503 tons, and in tilting furnaces 175,503 tons of the fuel would be shipped to this country only to be converted into heat to be dissipated in radiation and flue losses.

I have confined my figures to the melting of brass alone, and they do not include the fuel used for melting the large quantities of malleable iron, certain steels, aluminum, special alloys, cupronickel, etc., that are melted in crucibles.

The furnace efficiencies given above are those for general all-round work. Actual test efficiencies would be somewhat higher.

Comparative Efficiencies

From a point of view of overall working heat efficiencies there is therefore not much to choose between crucible tilting furnaces for any class of fuel—coal, coke, oil, town gas, or producer gas—if the most economical size and type is taken for each fuel; but where pit furnaces are concerned there is a very marked difference, and those fired by means of town gas now hold the palm. For convenience of comparison the quantities of fuel and their costs, and also the heat efficiencies of furnaces for different kinds of fuel, are given in Table I. (above). Table II. (above) shows the approximate heat values of different fuels.

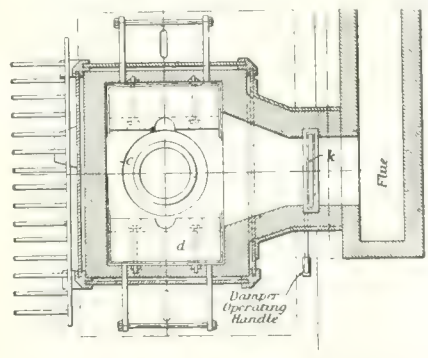
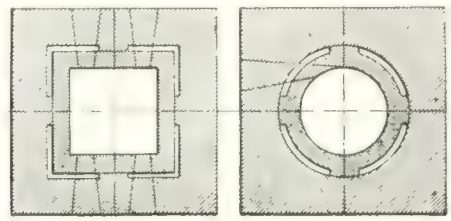


FIG. 2. PLAN OF SUGGESTED FURNACE.

The reason why tilting furnaces have so much higher heat efficiencies than pit furnaces is in a measure due to the elimination of many of the absurdities of the pit type, but chiefly is it due to the higher grade and quicker-heating crucibles used in the former when taken in conjunction with the larger capacities of the crucibles. For output and cost of melting it is undisputed that the tilting furnace plant is a long way ahead of pit furnaces, but on the question of quality of alloy made the tilting furnace has not definitely proved that it possesses this feature. Experts seem still to maintain that the pit furnace taking smaller crucibles has not yet been superseded as far as quality of metal is concerned.

It is quite conceivable that this is so, and as the efficiency of the present-day pit furnace is so very low it becomes more than ever necessary to see whether the design cannot be improved. With this end in view I have suggested a furnace as illustrated in Figs. 1 and 2.

In this furnace it is intended that the lining shall be thick, in order to reduce the amount of heat radiation. An air insulating cavity is suggested between



FIGS. 3 AND 4. SHOWING AIR INSULATING CAVITY BETWEEN INNER AND OUTER LINING.

the inner and outer firebrick lining (Figs. 3 and 4), or this cavity can be packed with zirconia earth. The outside of the furnace to be fitted with expanded metal for lagging. The flue outlet to be central, and the flame issuing to be at any time visible to the operator. The secondary flue opening to the main flue to be controlled by means of a damper, and a preheating hearth to be arranged in this flue passage. The furnace to have an outside metal cover, so that all products of combustion and zinc smother will be drawn into the main flue. The bottom to be in the form of a hinged pan for collection of spilled metals and the space above filled with quartz nodules into which slag can soak below the level of useful fuel (in coke-fired furnaces) and away from the burner inlet of oil or gas-fired furnaces.

When it is essential to use small capacity crucibles a greater degree of economy can always be obtained in multiple crucible furnaces. Very useful types of gas-fired furnaces have recently been described—notably the Hermansen furnace and the Parsy furnace, both of which are on the self-contained producer principle.

A type of oil-fired multiple crucible furnace that I designed some years ago has given, I believe, very good results. The difficulty I had to contend with was

the absence of cutting of gas ... possible in a multiple crucible furnace having one large melting chamber. Figs. 5 and 6 show a furnace which entirely gets over this difficulty.

It has a common melting chamber at the base of the crucibles, but the upper portion is divided off into separate compartments, each with its own flue outlet. ... can ... are at the same time good conductors of heat. In the *Foundry Trade Journal* for July 12, 1912, certain facts bearing upon this were noted; for instance, a firebrick of moderately good quality, although relatively inferior as a refractory material, was shown to have insulating much less heat than the higher grade refractories, silica, alundum, etc. ... there may be given a really valuable treatise upon this subject.

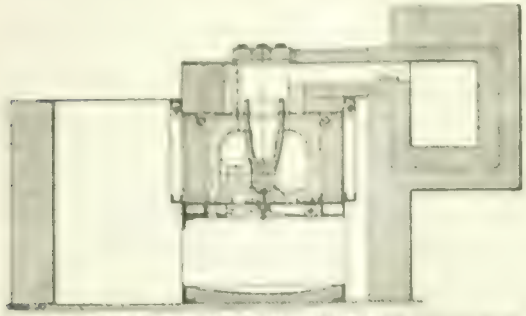


FIG. 5. SECTIONAL VIEW OF MULTIPLE CRUCIBLE FURNACE FOR OIL, GAS OR POWDERED FUEL.

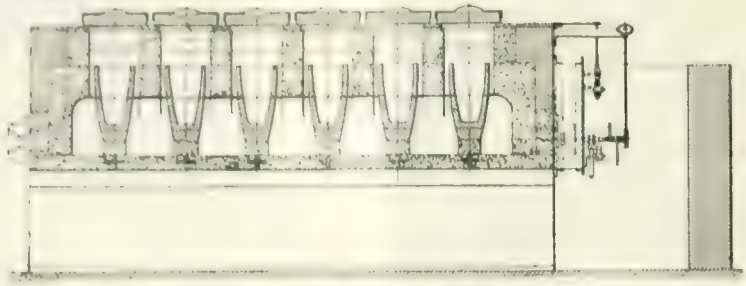


FIG. 6. SHOWING ARRANGEMENT OF CRUCIBLES IN FIG. 5 AND LOCATION OF FUEL BURNERS.

It is found that the removal of any one ... of the way affects the actual melting conditions in the other chambers. This design makes it possible to use two oil fuel burners for a six-crucible unit instead of six burners for separate furnaces. The working efficiency of this type of furnace is about 10 per cent., as compared with 5 per cent. in single crucible furnaces. There is a saving of 50 per cent. of fuel in favor of the multiple crucible furnace.

Waste Due To Poor Refractories

The relatively poor qualities of refractories used as linings are in a great measure responsible for ever-varying fuel consumptions.

When a furnace is newly lined it has the highest heat efficiency, but as the lining becomes worn or broken away the fuel consumption can well be double the amount used when the lining is new. In order to overcome this trouble to some extent in tilting furnaces, and so keep the fuel consumption at a more uniform level, I have suggested the special form of grate pan shown in Fig. 7. It is found that more or less liquid slag at the end of a heat moves to the front of a tilting

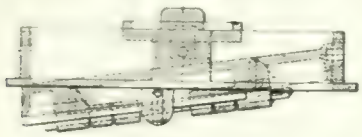


FIG. 7.

furnace as the metal is poured, becomes set round the front of the crucible and obstructs the passage of air at this point. The result is that the lining is cut away by the inrush of air and intense heat at the back and round the sides of the coke space, and the fuel space becomes greatly increased at these points. It is hoped that with the new form of bottom grate pan the slag will accumulate below the useful fuel line, thereby saving the life of the lining and reducing fuel consumption.

Radiation losses can be reduced to a certain extent by providing composite linings. It is well known that the most refractory materials, such as carborundum, carbon carbide, magnesia—whereas the ordinary red building brick showed undoubtedly the best insulating properties. An inch of lagging on the outside of the furnace also reduced heat radiation losses by more than 50 per cent.

The greatest loss of heat in a melting furnace occurs in the waste gases, and it has been proposed that CO_2 recorders should be used as a guide to the state of combustion. This is more or less impracticable, owing to the number of furnaces often installed.

Suppose there are 50 pit fires connected to one main flue, it would then be necessary to fit a CO_2 recorder in each individual branch flue. An analysis of gas in the main collective flue would not indicate which furnace was working inefficiently. Besides, in coke-fired furnaces the constituents of waste gas vary momentarily, and when fresh fuel is added there is a high percentage of CO, which passes straight into the flue. Only when gas or oil-fired furnaces are used can the combustion be confined within economical limits. A visual flame issuing from the central furnace flue outlet then indicates the state of combustion with sufficient clearness for all practical purposes.

These suggestions are only put forward as possible means of improving the heat efficiencies of pit-fire furnaces for coke, oil or gas, but the real question remains still unsolved, viz., how to utilize the major portion of the heat contained in fuel. The satisfactory application of powdered coal certainly offers an alluring proposition.

In conclusion I would express my indebtedness to the Morgan Crucible Company, Limited, for permission to submit this paper to the Institute of Metals, and for the information which has enabled me to estimate the output of brass for 1916 within probable limits.

The paper has been written almost at the last minute; but if members consider that it is incomplete and inconclusive, I hope that it will serve as an incentive to others to continue this research, and at the next meeting perhaps

BRITAIN TO USE CANADIAN MATERIALS

AN announcement from London, England, states that the Executive Council of the Imperial Institute has constituted an Advisory Committee for Canada. This committee consists of Sir George Perley, K.C.M.G., High Commissioner for Canada, chairman; Sir Robert Kindersley, K.B.E., governor Hudson's Bay Company; J. G. Colmer, C.M.G., former secretary, High Commissioner's office in London; J. H. Plummer, Dominion Steel Corporation, and Sir Keith Price, of the Ministry of Munitions.

One of the most important matters on which action is being taken by the committee is that of the more extensive utilization of Canadian timbers in the United Kingdom. The Imperial Institute Advisory Committee on Timbers has been taking evidence on this subject. Arrangements have been made for a series of practical trials of selected British Columbia timbers to be carried out by H. M. Office of Works, with a view to the inclusion of these timbers in official specifications.

There will probably be a considerable demand by tanners in the Dominion for Indian cowhides (kips), which before the war were mostly taken by Germany and Austria. Small trial consignments of the kips have been supplied by the Hides Committee to Canadian tanners, and several firms have expressed a desire to see larger samples. The committee has sent a representative collection of Indian cowhides to Canada, and the Department of Trade and Commerce has undertaken to arrange for these to be exhibited at a number of convenient centres in the Dominion.

The outbreak of war caused a very large increase in the demand in the United Kingdom for special steels containing molybdenum and other comparatively rare metals. The British Government finally took control of the supplies of molybdenum ore and the Imperial Munitions Board at Ottawa was commissioned to purchase Canadian ore on their behalf. Considerable quantities of molybdenite ore are now being produced in Canada, largely through the special assistance given by the Canadian Department of Mines.

DEVELOPING FOREIGN MARKETS FOR BRITISH PRODUCTS

C. HAMILTON-WICKES, H.M. Trade Representative in Canada, in a recent address before the Engineers' Club of Manchester, discussed the question of how best to develop the manufacturing industry of Great Britain and distribute its product.

Emphasis was made on the importance to British manufacturers of developing a retail market for their product both at home and abroad, if they would meet the competition which would develop after the war.

In conclusion, the following constructive recommendations were advanced:—

(1) To take stock of present productions, their character and uses, the markets which consume them and why, and the channels whereby the consumers are supplied.

(2) To consider the necessity for the employment of efficiency and component engineers and efficient methods of "costing," the scrapping and replacing of out-of-date plant and equipment, with the possibilities of turning to commercial use machinery now employed in making munitions.

(3) The advisability of having on the board of direction the men responsible for running the works, and as well, those charged with the distribution of its products.

(4) To ascertain how far and in what direction advantage may be taken of the recently organized bank under Lord Faringdon, Mr. Dudley Docker, and others; to ascertain the extent and direction in which the information secured from the freshly consolidated departments for the Imperial Commercial Intelligence Service can be utilised.

(5) The organization of an Export Sales Department as distinct from the Home Sales Department; the training of commercial engineers.

(6) The consideration of the question of absolute merger or combination with other firms, or the cartel system, i.e., a merger limited in time.

POSTAL CENSUS OF MANUFACTURERS

THE postal census of the manufacturers of Canada, taken in 1916, for the calendar year 1915, just issued, shows a general expansion in the manufacturing business of the Dominion. The number of establishments in operation was 21,306, representing an invested capital of $1,994,103,272, employing 52,683 persons on salaries and 462,200 persons on wages, and producing goods to the value of $1,407,137,140 from raw materials valued at $802,135,862.

During the decade 1905-15 the number of establishments increased by approximately 34 per cent., capital 135 per cent., employees on salaries 44 per cent., employees on wages 29 per cent., salaries 96 per cent., wages 70 per cent., and the value of products 95 per cent.

The value of the products of factories in 1915 was $1,407,137,140, as compared with $718,352,603 in 1905, an increase of $688,537, while wages paid totalled $229,456,210, an increase of $95,080,285.

There were in Canada during the year covered by the statistics 65 establishments employing 500 hands, 25 employing over 1,000, nine employing over 2,000, five employing over 3,000, and three employing over 4,000. Of these three establishments two employed over 5,000 hands.

During the five-year period, 1910-1915, the capitalization of Canadian industrial enterprises increased by $746,520,663, or about 60 per cent.

SMOKELESS COMBUSTION PROBLEMS

THE results of recent investigation into the smokeless combustion of fuel in steam boiler furnaces were the subject of a communication by Osborne Monnett, formerly chief smoke inspector of Chicago, before the Engineers' Society of Western Pennsyvlania.

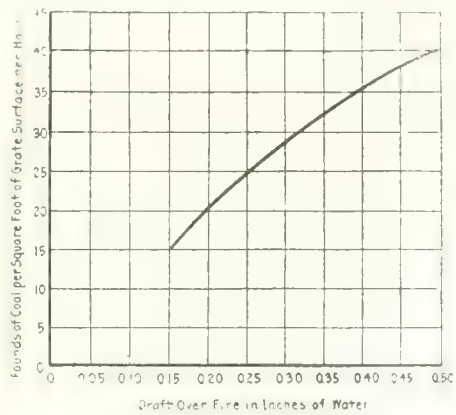


CHART SHOWING RELATION OF DRAFT TO FUEL CONSUMPTION.

The investigation developed a rough rule that 0.1 in. of draft was necessary over the fire per pound of coal burned per square foot of grate surface per hour. The limiting rate for successful smokeless combustion for hand-fired furnaces is about 28 lb. of coal per square foot of grate surface per hour.

In studying the smoke problem in Chicago, it was found that a firebrick arch directly over the fire increased the amount of smoke due to the fact that there was not only the normal distillation of volatile matter, but also an artificial distillation due to the high temperature of the heat radiated from the arch over the fire. This secondary distillation results in dense smoke despite all efforts to prevent it. The removal of the arch from directly over the fire diminished the rate of distillation of volatile matter and eliminated the production of smoke.

GANISTER AND ITS USE

GANISTER is supplied in finely crushed or ground form and when properly used stands heat well, but, of course, under certain conditions it fuses and runs to slag, particularly where another material which acts as a flux is being used in the furnace. For cupola work rather a coarse form of ganister is used, especially where the whole of the furnace is rammed up with this material, but for brass and other crucible furnaces a finely powdered ground ganister should be used. In preparing any form of ganister for use it has to be damped down and trodden and kneaded into a putty-like mass; the tougher it is made the more durable it becomes in the presence of direct fire-heat. For patching and daubing up furnaces where the fire-brick is burnt away, about the best material to use is finely ground ganister of the quality selected for steel furnaces. In making repairs all clinker should be chipped off the bricks, and then a wash of good clay slurry applied. While this is still damp, the ganister, trodden and kneaded stiff like putty, should be put in and beaten smooth with a mallet or other suitable implement, as smooth a surface as possible being secured. This material, well put on, will stand for a considerable time, and as it is not specially costly can be used with freedom.

EFFECT OF OIL ON ROUGH WATER

By T. J.

WAVES in mid-ocean are caused entirely by the action of the wind. The adhesion between the rapidly moving particles of air which compose the wind and the surface particles of the water causes the water's surface to be dragged along with the air. Small ripples are immediately formed, and these soon overtake others near them. They unite, and, due to the friction between the water particles, each succeeding ripple piles up on the top of the previous ones. Just as soon as oil is spread on the water, however, the size of the waves is reduced like magic. The reason for this is interesting. Oil, unlike water, has very little internal friction between its particles. The ripples of oil formed by the wind, therefore, cannot pile upon each other to any considerable height; hence water waves cannot grow in an area of oil placed about a steamer. They begin to fall down instead. By the time these waves reach the boat they will have lost their formative ripples, and the result is a perfectly calm surface over the portion of the sea through which the boat is making its way.

IN co-operation with the Bureau of Mines, an investigation of the electric melting of brass is being conducted at Cornell University. The experiments indicate that the use of a suitable electric furnace will materially reduce melting losses and the Bureau of Mines now is testing an electric furnace built according to the design worked out by the laboratory tests. This furnace is of commercial size and is being tested with a view to ascertaining its suitability for such processes as are used for cartridge and shrapnel cases.

THE REASON WHY

By Chief Examiner

SHELL makers, especially makers of high explosive shells, be they firms or operators, often rail against the restrictions placed upon them by the Government inspector. They rail against what they think is red tape, fad-dism, foolishness, or stubbornness and autocracy. In many instances it would be much better if an inspector would give his reasons, instead of simply demanding a thing to be done. The trouble is, however, that if he did so an argument would surely arise and time would be wasted. Here are a few of the "reasons why" a high explosive shell must be made correctly.

Let me first mention the "bore," one of the principle "bones of contention." The bore must be perfectly smooth. When the high explosive, T.N.T., lyddite, or whatever else is used, is first put into the shell, it is in a liquid or semi-liquid state, about the consistency of thin porridge.

It is then stirred slowly; sometimes a highly-polished steel rod is used, and in other cases a glass rod. As it is stirred, it slowly hardens, and just before it "sets" the "form" for the "exploder container" is inserted. To explain the extreme danger of this stirring operation, it may be mentioned that a few years ago a piece of grit got between the explosive as it was "setting" and the steel rod and ——, one of the buildings at Woolwich Arsenal and 27 men were annihilated. The annihilation was so complete that a button and an ankle inside a boot were all that was found of the men. The boot was discovered more than half a mile away.

Internal Happenings

When the shell is fired it receives a blow behind it of something over two hundred tons. It immediately begins to revolve at the rate of 3,000 revolutions per minute. Remember it attains this speed not slowly but instantaneously, and leaves the muzzle of the gun with a velocity of approximately 2,600 feet per second. These figures are for a 4.5 in. shell. The larger ones, of course, require a heavier blow and do not travel quite as fast, the difference, however, being slight. Now imagine for a moment what would happen if the bore had any roughness in it—you might just as well hold a match to an emery wheel, because when the blow is delivered the hardened explosive separates from the sides or wall of the shell and forms a core. The steel being heavier and more solid than the explosive, attains the high speed before the core.

To ensure, or make doubly sure, that the bore is smooth, it is varnished, and the varnish must be a perfect coat without any overlapping, ridges, or lumps of hard varnish sticking to it. This varnishing has other purposes, one being to prevent the explosive from touching the steel. Not even the minutest pin hole in the varnish is allowed to pass. When the two opposing elements, explosive and steel, touch each other, "Picric," the most explosive of all, is at once generated in the form of a gas or acid. The shell loaded might be laid aside for storage, and this picric might form, owing to imperfect varnishing, and go on forming till the shell, receiving a slight jar, would "go off" and quite possibly set off every loaded shell in its vicinity. The varnish must be perfect in every way. For this reason, air drying varnish has been done away with, and only baking is allowed to be used. There are hundreds of shells lying buried under the sod in Flanders unexploded, some of which are almost sure to have faulty varnish. Some day a heavy wagon may rumble over one of them, or a plow share strike another. If it does—then goodbye the outfit.

Base Defects

There are often grumbles and grouches because the inspector requires that tool cuts and "pit marks" in the bottom of the bore be removed. The explosive fills up the indentation, and when the blow comes and the shell begins to revolve, the portion of the explosive in the hollow breaks off from the rest, and—well rub one match against another and see what happens.

Another bad fault in the bottom of the bore is little black holes, which may or may not be "piping." It is absolutely necessary that all traces of such be removed. Piping in the base is almost sure to cause a premature explosion of the shell because of the weakness it leaves.

A very interesting point about a high explosive shell—or any other shell where the walls are of a uniform thickness—is the "set up" and "set down." The steel has a certain tensile strength, and this must conform to the limits set by the inspection department of the Imperial Ministry of Munitions. When the blow hits the shell behind, the back half tends to overtake the front half, with the actual momentary result that the walls bulge outwards and at once return to the original form—if the tensile strength of the steel is correct. If it is not correct, the walls will not return, the shell will jamb in the gun, and in all probability the gun will burst. If it does not burst, it will be lifted sheer back on the top of its own men.

The same result will happen if there are any flaws, seams, or ghost lines in the steel. It is, therefore, most important that the visual examination, both internal and external, be minute and exhaustive.

A Band Performance

The driving band, too, is of the utmost importance, because it is due to this being gripped by the rifling in the bore of the gun that the rotary motion is given to the shell. The band must be absolutely down in its groove and pressed right home in the undercuts and on the wave ribs. If the band were to slip or tear the shell would not go through the air in a straight, swift manner, but would "wobble" and might hit the ground anywhere but the point it was intended for.

A friend of the writer was at the front in the earlier days at Ypres and relates how a shell with an imperfect band had fallen "short" into our own lines. Half the band had been torn out of its groove, and this portion caught one of his comrades and sheared the flesh off his leg from the knee upwards. He told how all the boys around cursed the inspector who had passed that shell.

The threads in the nose must be right, because if the diameter be too large the fuse will be loose when screwed in, and if the threads of the fuse do not engage the nose threads of the shell, the former will simply blow out and the shell will not explode perfectly, thereby failing to do its duty. If, on the other hand, the diameter is too small, the fuse will not screw home, and that is also a source of great danger.

One must remember that on the field of battle there is not time to repair those things. It is often a matter of life and death to hundreds of our brave boys to have things working right, and they have but one thought—to get the shell into the gun and on its way to protect them. When one stops to think a moment of the awful seriousness of making a shell properly, one begins to realize what criminals those men are who try to get bad work past the inspectors.

Not to be Mentioned

The writer could tell of fearful things that have been attempted, simply in order to ring in the dollars and cents—but that would not do, because those who are innocent and free from the bad thoughts and actions which some have yielded to would perhaps learn too much. The least said the soonest mended in that respect. For the sake of our boys at the front, let me implore all those who are making shells to forget their silly ideas about "red tape" and make their shells properly; cheerfully yield to the wishes of the inspector on the job, and try to help him instead of hindering him and making life miserable for him. They will then make a good name for themselves and gain the gratitude of those who are fortunate enough to return from the desolate plains and wasted ridges of Flanders.

RECENT experiments have shown that one coat of paint, properly applied, is a better preventative of rust on metal than are several coats. The "Bulletin de la Societe des Ingenieurs Civils de France" states that iron plates well cleaned and polished were coated, some with one coat and some with two, three or more coats of paint, and then exposed to the action of steam for a whole day, after which the paint was removed and the plates were examined. The first was as bright as it was before exposure to steam, the second showed a few rust spots, the third was still more attacked, and the fourth entirely so. This result is due to the fact that the deeper layers dry badly and tend to dissolve the uppermost coating, increasing its porosity to air and moisture. It is, therefore, advisable to cover the plates with one coating only of paint or varnish and completely to remove any old paint before doing so.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

THE MANUFACTURE OF HARDENED THREAD GAUGES—III*

By G. Doorakkers

THE tool for cutting external gauges, which is made out of the best cast steel obtainable, is shown in Fig. 18.

Tool for Cutting External Gauges

As previously mentioned, the tool is cut away 1/16 in. under centre, and in that section has to cut the correct shape of thread. The master tools have therefore to be set 1/16 in. under centre, which can be done by inserting a ⅛ in. mandril between the centres. To ensure the thread being upright the setting piece—Fig. 16—is used. The cutting edge of the tool must be horizontal, and is tested with a good small spirit level or with a straight edge. In the first case the bed of the lathe must be tested for horizontality.

The re-grinding of the master tool is done on an angle piece on the magnetic chuck of a surface grinder, and the tool is clamped against the flat, so that the new cutting edge lies in a plane which is perfectly parallel to the original cutting edge. The width of the threaded portion is turned to about four threads to make it convenient for measuring purposes, and is afterwards turned away to one full thread following the lead of the screw.

To enable the form tool to cut freely, the thread of the tool must be cut the opposite hand to the thread on the work, and the helix angle of both tool and work must be approximately the same. If the work is either larger or smaller than the tool the thread on the tool cannot be a continuous spiral, but every thread has to be cut separately, running out into the gap, and the pitch is obtained by using a micrometer stop.

Fig. 19 shows the tool laid out for operation. The four principal dimensions—see Fig. 18—are the outside diameter, the dimension over three wires A, and the depth of the thread, or rather the dimension from top to root, B. The calculations of these dimensions are as follows:—In Fig. 20:

M B = 1.000 in.

M E = .0625 in.

B E = $\sqrt{(1 - 1\ 16^2)}$ = .99804

B D = B + C in Fig. 1 = .16008 P + .64032 P = .8004 P.

D E = B E — B D = .99804 — .8004 P.

D M = $\sqrt{(D\ E^2 + 1/16^2)}$ = $\sqrt{[(.99804 - .8004\ P)^2 + 1/16^2.]}$

A E = B E + .16008 P = .99804 + .16008 P.

A M = $\sqrt{(A\ E^2 + 1/16^2.)}$

F G = A M — D M. The angle a can be found from $\tan a = \frac{½\ P}{F\ G}$

The depth of the thread = H J; H J = M C = $\sqrt{(C\ E^2 + 1/16^2)}$ where C E = M B — M C where M B = 1.30 and D E + .106008 P.

The dimension B in Fig. 18 is therefore 2 in. — H J.

Angle a in Fig. 20 being known, the distance over the three wires can be calculated as follows:— In Fig. 21: in triangle A B C,

$$A\ C = \frac{½\ d}{\sin a}$$

$$A\ H = A\ C + ½\ d = \frac{½\ d}{\sin a} + ½\ d$$

The distance of the wire above the top of the thread X = A H — K, where K = 1in. — M D—see Fig. 20.

$$x = \frac{½\ d}{\sin a} + ½\ d - (1in. - M\ D) =$$

$$½\ d\left(\frac{1}{\sin a} - 1\right) - 1in. + M\ D.$$

Dimension A in Fig. 18 = 2 in. + 2 x.

The helix angle for the tool must be approximately the same as for the work. This angle is the tangent on the screw line at a point of the circle going through half the depth of the thread.

Assume the outside diameter of the work = W, then the circle to be considered has a diameter W — C (C is taken from Fig. 1). Now the outside diameter of the form tool = 2 in., and the depth of the thread is H J = 1in. — M C — see Fig. 20. The diameter of the form-tool to be considered is therefore: 2 in. — (1in. — M C) = 1in. + M C. In Fig. 21A, in triangle A B E, A B = pi (W — C).

$$B\ E = ½\ P.\quad \tan a = \frac{B\ E}{B\ A} = \frac{P}{2\ pi\ (W - C)}.$$

Angle a, being the helix angle, should be the same for the form-tool.

In triangle F G H, F G = pi (1in. + M C).

G H is one-half of the new pitch.

$$G\ H = F\ G \tan a = \frac{(1in. + M\ C) \times P}{2\ (W - C)}$$

This value is expressed in the nearest number of threads per inch we can cut with the lathe. Assume the number of threads per inch = N, then

$$N = \frac{1}{2\ G\ H} = \frac{W - C}{(1in. + M\ C) \times P}$$

Example.—A twenty-four thread circular tool for external gauges of .880, and .883, .886 diameter is wanted. The diameter of the wire = .025 in. The outside diameter is 2.000. The dimension from the top of the thread on the one side to the root of the thread on the other side is B, where B = 2 in. — H J.

H J = 1in. — M C.

M C = $\sqrt{(C\ E^2 + 1\ 16^2)}$

C E = D E + .16008 P.

D E = B E — B D

B E = .99804.

$$B\ D = \frac{.8004 \times 1}{24} = .03335.$$

D E = .99804 — .03335 = .96469.

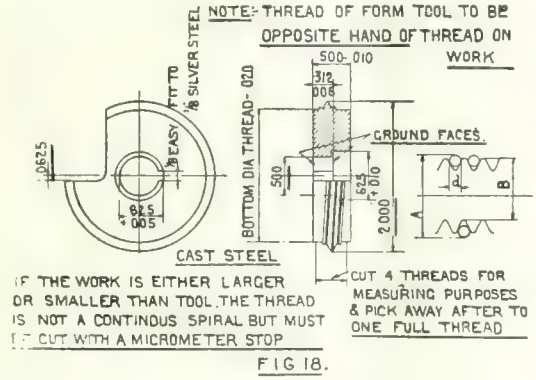

NOTE:- THREAD OF FORM TOOL TO BE OPPOSITE HAND OF THREAD ON WORK
500-.010
.312 .008
GROUND FACES
BOTTOM DIA THREAD-.020
.0625
EASY
⅛ SILVER STEEL
.500
.625 +.010
2.000
.625 -.005
CAST STEEL
IF THE WORK IS EITHER LARGER OR SMALLER THAN TOOL THE THREAD IS NOT A CONTINOUS SPIRAL BUT MUST BE CUT WITH A MICROMETER STOP
CUT 4 THREADS FOR MEASURING PURPOSES & PICK AWAY AFTER TO ONE FULL THREAD

FIG. 18.

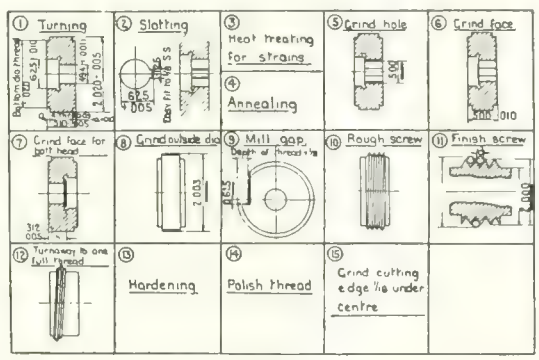


FIG. 19.

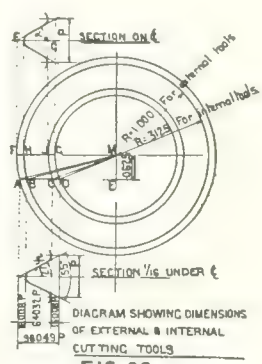

SECTION ON ℄
For external hols
For internal hols
SECTION ⅛ UNDER ℄
DIAGRAM SHOWING DIMENSIONS OF EXTERNAL & INTERNAL CUTTING TOOLS

FIG. 20.

*Contributed to a recent number of The Engineer. No. 2 appeared Nov. 8.

1.973367.

The dimension over the three wires = A.

A = 2.000 + x.

DIAGRAM SHOWING DISTANCE OF WIRE ABOVE TOP OF THREAD, FOR EXTERNAL SCREWING TOOLS

FIG 21

$$x = .0125\left[\left(\frac{1}{\sin a} \div .4624365\right) + 1\right] - 1 + M\ D.$$

a = 27 deg. 32 min. 40 sec.

M D = (D F² + 1.16²) = √(.96469² + 1.16²) = .966712.

$$\text{Tan } a = \frac{\frac{1}{2}P}{FG}$$

F G = A M — D M.

A M = (A F² + 1.16²)

A F = B E + .16008 P = .99804 + .06669 = 1.004709.

A M = (1.004709² + 1.16²) = 1.00665.

F G = 1.00665 — .966712 = .039938.

$$\text{Tan } a = \frac{.02083}{.039938} = .521559.$$

a = 27 deg. 32 min. 40 sec.

x = .0125 [(1 ÷ .4624365) + 1] — 1 + .966712 = .0062428.

A = 2.000 + .0124856 = 2.0124856.

C = .026675.

M C = .96469

P = .04166

$$N = \frac{.884 - .026675}{1.973367 - .04166} = 10.4 \text{ threads per inch.}$$

With reference to the wires it is very important that these wires should be of the same diameter and perfectly round, as a difference in the diameter is multiplied about three times in the dimension over the three wires, owing to the wedge shaped form of the thread. The best diameter of wire to use is the diameter that touches the flanks about half way down the depth of the thread. In the calculation of the distance over the three wires—Fig. 21—a small error is introduced owing to the helix angle which allows the wire to drop down to a slightly larger angle. This error, however, is so small that it can be neglected entirely, except in the case of a small diameter compared with a coarse pitch. It need hardly be mentioned that micrometers and other measuring instruments employed must be thoroughly tested and adjusted before using.

The depth of the thread is measured with a micrometer attachment, shown in Fig. 22. This attachment is clamped on to the anvil of the micrometer. It is important that the face fitting on the face of the anvil be perfectly flat, and the knife edge must be perfectly parallel to that bottom face. The best way to produce that part of the attachment is to

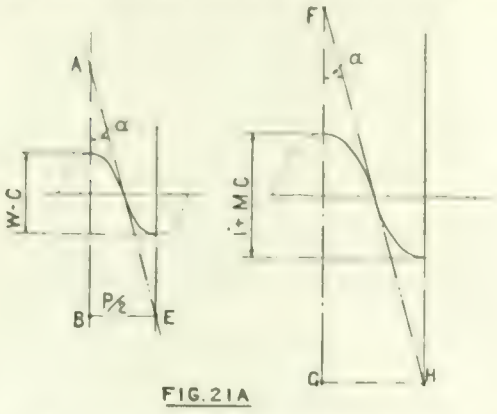


FIG.21A

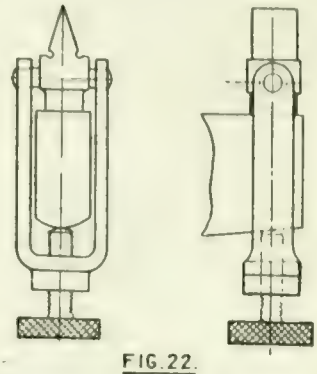


FIG.22.

an the face carefully after hardening, and then grind the knife edge parallel on a true magnetic chuck, afterwards stoning the sides again to an edge. The results obtained with the attachment were quite as good as with the three triangular pieces, and, moreover, much more quickly obtained. The master tools are held in a special tool box—Fig. 23—of the solid type. The spring holder might possess certain cutting advantages, but leads sometimes to slightly elliptical work. The special tool box is provided with a vertical adjustment by means of a taper wedge a which is moved by the screws b. The plane of the cutting edge of the tool can be brought horizontal by means of the screws c, which move the lever d in the required direction.

The circular form-tool for cutting external gauges is again held on a solid type of tool box—Fig. 24. The bottom face of the box is ground, and the face A is ground square to the bottom face. The bolt hole is bored true to both faces. The face of the form tool can be used for setting the tool to ensure that the thread is upright.

Tools for Cutting Internal Gauges

Fig. 25 shows the tool for cutting internal or female screw gauges. It is made of cast steel, and cuts again 1/16 in. under centre. The true shape of the thread therefore 1/16 in. under centre, and the calculation of the shape is similar to that made for external gauges. What was said about the helix angle for

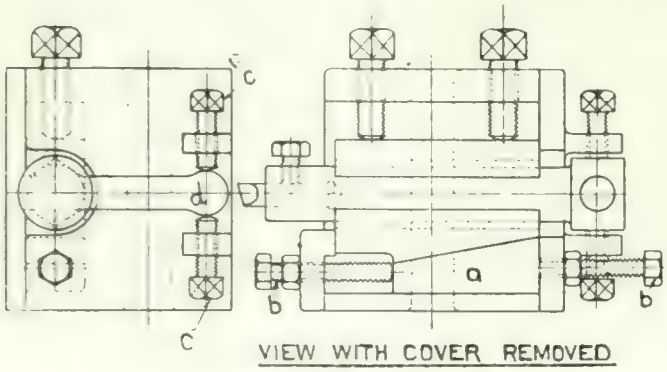


FIG.23.

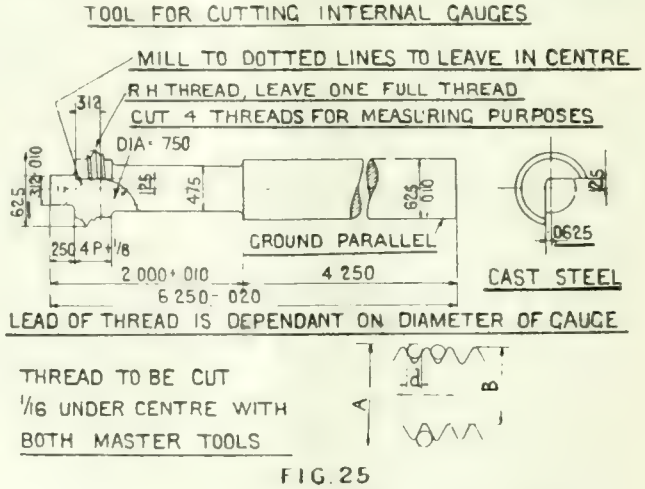


FIG.25

The number of threads per inch of the

$$N = \frac{W - C}{(1\text{in.} + M\ C)\ P}$$

$$W = \frac{.880 + .886}{2} = .883.$$

external tools also applies in this case.

For calculation purposes we can use again Fig. 20 by substituting for M B = .3125 instead of 1in.

M = .3125.

M E = .0625.

B E = $\sqrt{(5/16^2 - 1/16^2)}$ = .306186.

B D = .8004 P.

D E = B E — B D = .306186 — .8004 P.

D M = $\sqrt{(D E^2 + 1\ 16^2)}$ = $\sqrt{[(.306186 - .8004\ P)^2 + 1/16^2]}$

A E = B E + .16008 P = .306186 + .16008 P.

A M = $\sqrt{(A E^2 + 1\ 16^2)}$

F G = A M — D M.

The angle a can be found from tan a = $\frac{\frac{1}{2} P}{F G}$

The depth of thread = H J.

H J = M B — M C, where M B = .3125.

M C = $\sqrt{(C E^2 + 1/16^2)}$ where C E = D E + .16008 P and H J = .3125 — M C; therefore in Fig. 25 B = .625 — H J.

Angle a in Fig. 20 being known, the distance over the three wires can be calculated as follows:—In Fig. 21, in triangle A B C:

$$A C = \frac{\frac{1}{2} d}{\sin a}$$

$$A H = A C + \frac{1}{2} d - \frac{1}{2} d \left(\frac{1}{\sin a} + 1\right)$$

x = A H — K, where K = .3125 — M D (see Fig. 20).

$$x = \frac{1}{2} d \left(\frac{1}{\sin a} + 1\right) - .3125 + M D.$$

Dimension A in Fig. 25 = .625 + 2 x.

The helix angle should again be approximately the same for the tool and the work.

Assume again W, the outside diameter of the thread of the internal gauge. The diameter to be considered is W — C. The outside diameter of the form-tool is .625, and the depth of the thread is .3125 — M C—see Fig. 20. The required diameter is therefore .625 — (.3125 — M C) = .3125 + M C.

In Fig. 21 A, in triangle A B E:

A B = pi (W — C).

B E = $\frac{1}{2}$ p.

$$\text{Tan a} = \frac{B E}{A B} = \frac{P}{2 \text{ pi } (W - C)}$$

Angle a is the same for the form-tool.

In triangle F G H, F G = pi (.3125 + M C). G H is one half of the new pitch.

$$G H = F H \tan a = \frac{(.3125 + M C) \times P}{2 (W - C)}$$

This value is again expressed in the nearest number of threads per inch: N

$$N = \frac{1}{2 G H} = \frac{W - C}{(.3125 + M C) \times P}$$

Example.—A fourteen thread circular form tool for internal gauges of 1.998, 2.004, 1.996, and 1.991 diameter is wanted. Diameter of wire d = .040. The outside diameter = .625 in. The dimension from the top of the thread on the one side to the root of the thread on the other side is B, where

B = .625 — H J.

H J = .3215 — M C.

M C = $\sqrt{(C E^2 + 1/16^2)}$

C E = D E + .16008 P.

D E = B E — B D, where B E = $\sqrt{(5/16^2 - 1/16^2)}$ = .3061862 and B D = $\frac{.8004 \times 1}{14}$ = .057171.

D E = .3061862 — .057171 = .2490152.

C E = .2490152 + .011434 = .260449.

M C = $\sqrt{(.260449^2 + 1/16^2)}$ = .2678427.

H J = .3125 — .2678427 = .04466.

B = .625 — .04466 = .58034.

The dimension over the three wires = A.

A = .625 + 2 x.

$$x = \frac{1}{2} d \left(\frac{1}{\sin a} + 1\right) - .3125 + M D,$$

where d = .040.

M D = $\sqrt{(D E^2 + 1/16^2)}$ = $\sqrt{(.2490152^2 + 1/16^2)}$ = .2567389.

$$\text{Tan a} = \frac{\frac{1}{2} P}{F G}$$

F G = A M — D M.

A M = $\sqrt{A E^2 + 1\ 16^2}$

A E = B E + .16008 P = .3061862 + .02243419 = .3176204.

A M = $\sqrt{.3176204^2 + 1/16^2}$ = .3237112.

F G = .3237112 — .2567389 = .0669723.

$$\text{Tan a} = \frac{.035714}{.0669723}$$

a = 28 deg. 4 min. 10 sec.

x = .020 [(1 ÷ sin 28 deg. 4 min. 10 sec.) + 1] — .3125 + .2567389 = .006743.

A = .625 + .013486 = .638486.

The number of threads per inch of the form-tool:

$$N = \frac{W - C}{(.3125 + M C) \times P}$$

$$W = \frac{1.991 + 2.004}{2} = 1.9975.$$

C = .04574.

M C = .2678427.

P = .071428.

$$N = \frac{1.9975 - .04574}{.5803434 \times .071428} = 47 \text{ threads}$$

per inch.

Fig. 26 shows the tool for cutting internal gauges laid out in operations of manufacture. When in use the tool is held in a square tool box between two V-strips, and as the shank is ground parallel off the centres that shank can be used for setting purposes.

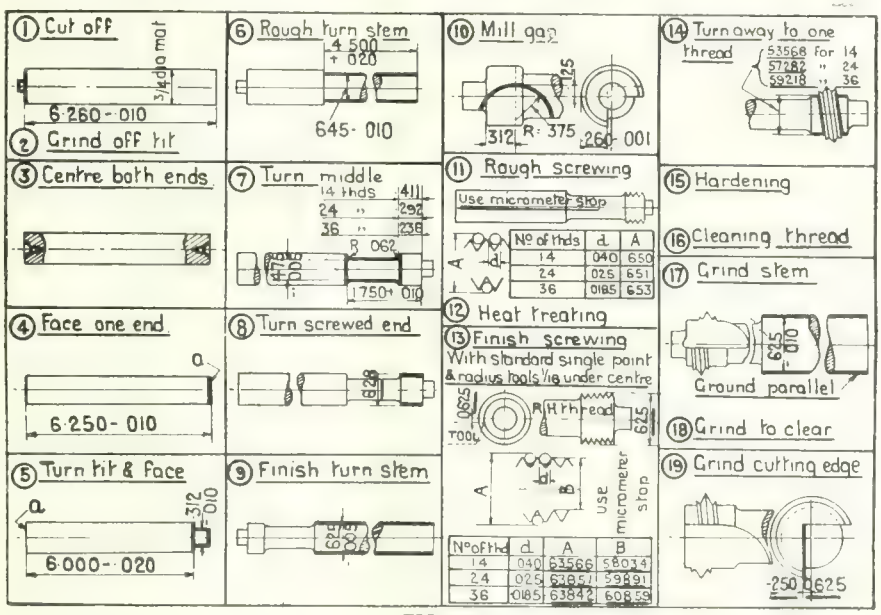
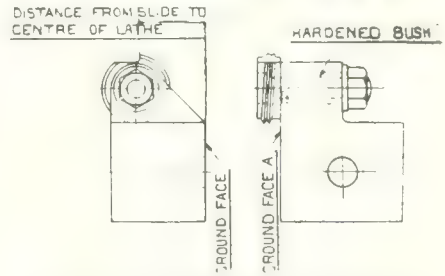


FIG. 26.



BOX FOR HOLDING INTERNAL GAUGE TOOL.

We have now obtained the necessary tools to start making gauges, except small female gauges. These have to be screwed with taps. The taps have to be very accurate, and must be screwed to gauges or useful results will not be obtained.

DIMENSION CONVERSION

IN order to conform to the practice of certain shops it is often necessary for the mechanics to convert fractional dimensions to their decimal equivalents, or decimal measurements to the corresponding fractional value, generally in thirty-seconds or sixty-fourths. Various tables have been compiled for this purpose, but it is not always that these are available when desired. To convert a fraction to a decimal equivalent all that is necessary is to divided the numerator (the upper term of the fraction) by the denominator or lower term. Hence to find the value of 7/64 in the form of a decimal, divide 7 by 64 = .109375.

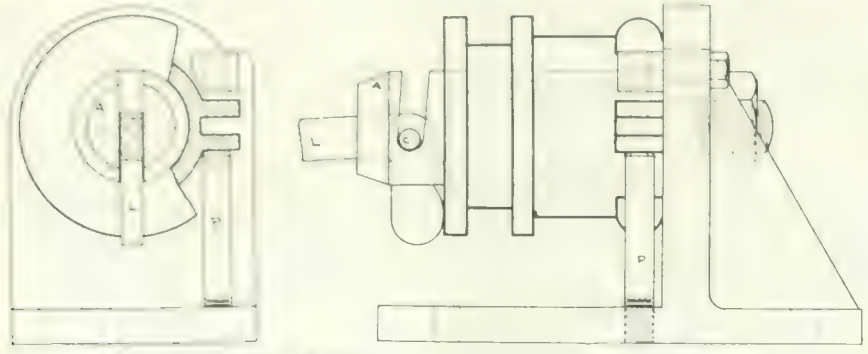
Suppose it is desired to find how many 64ths are contained in the fraction .6796. This can be calculated in two ways, by converting the fraction to a decimal and then multiplying by 64. Thus .67 divided by .96 equals .6458, and multiplying by 64 gives 42, or 42 64; or by multiplying the fraction directly by 64 we get the same result. To convert a fraction to its equivalent fraction multiply the decimal by the denominator of the desired fraction. Thus, to change .3215 to the nearest 28th, we get 9.002, which is just 2 1000 over 9.028. To find the number of 64ths contained in the decimal 0.203125, multiply by 64 and the integer of the product will be the desired number of 64ths; thus, .203125 x 64 equals 13. Therefore the equivalent of the decimal is 13/64.

DRILLING CLUTCH SLEEVES

By D. S. Mann.

THE sketch shows the accompanying drawing and tool in connection with an engine clutches was provided with four double ears at the one end, into which fitted the toggle connections to the shoes. As the clutch was self-locking, these holes must be drilled the correct distance from the end. The main body of the jig was of angle plate form and the arbor A, three inches in diameter, was turned down and held by the nut at the back. The sleeves were slipped on this arbor and the lower ear rested on the post P, which was adjustable in height. A hole was drilled in the end of this post sufficiently large so that the regular drill would enter.

The sleeves were held in position while drilling by the lever L, which was about eighteen inches long and bent so that the heel rested against the sleeve at the lower side. Due to the long leverage, a powerful pressure could easily be applied, though this was not necessary. When desired to index the sleeve one-quarter revolution the handle was merely raised at the end, turning about the pin C. The sleeve could then be pulled back with the other hand, sliding completely over the bend in the lever, turned and slid back into position. When all the holes were drilled, the handle was merely lifted out and the piece slid off. The pin C was, of course, fastened in the handle L. It would be difficult to devise a much quicker method of handling these pieces, as the clamping time was practically nothing.



QUICK-ACTING FIXTURE FOR DRILLING CLUTCH SLEEVES.

MEAN PROPORTION

By J. H. R.

IT is sometimes required to find the mean proportion between the lengths of two lines. This can be done either by calculation or by the graphic method. Taking X as the mean proportion between A and B, the proportion would be A : X : : X : B, or X² = A B. Suppose it is desired to find the mean proportion between two lines 3 and 4 inches long. Using the above proportion we have 3 : X : : X : 4, or X² = 4 × 3 = 12. Hence, X = √12 = 3.464 inches. Proof:—the product of the two extremes of any direct proportion must equal the product of the two means; thus, 3 : 3.464 : : 3.464 : 4, and 3 × 4 = 12, while 3.464 × 3.464 = 11.9993. The slight difference in the two values is due to the number of decimal places.

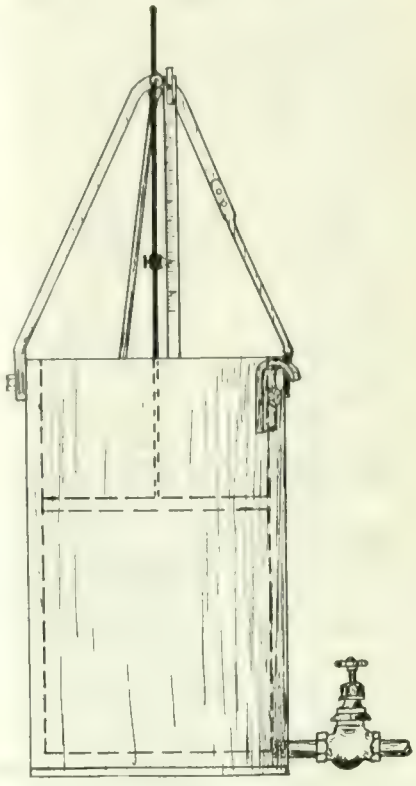
MEAN PROPORTION DIAGRAM

To find the mean proportion by the graphical method, proceed as follows: On a straight horizontal line lay off the lengths of the two known lines A-B and B-C. Bisect the total length A-C at the point O; from this point, with a radius O-A or O-C, describe the semi-circle shown. The perpendicular line B-D drawn from the juncture of the other two lines will be the mean proportional length.

FUEL MEASURING TANK

By D. O. Barrett.

IN taking fuel consumption tests of internal combustion engines, the writer has found the tank shown in the cut to be the most satisfactory method of measuring the amount of fuel used. The tank is a cast iron cylinder accurately bored and the measurement taken. A float is provided in the tank, three arms being attached to the float, so that it will remain central and prevent the rod attached to the float being bent when the tank is moved. To this rod is attached an indicator moving along a 24-in. steel scale graduated in hundredths, this scale being supported by the brackets shown. The tank being rather heavy, hooks were provided so that it could be easily lifted by the crane. The size of the tank to be used, of course, depends upon the size of engines to be tested, but should be large enough so that any ordinary run may be made without the necessity of refilling. The one shown was bored to 15.995 in., so that each inch in height represented 0.867 U. S. gallons. Readings being made on the scale graduated to hundredths could thus be made very accurately and easily. These readings could be transferred to pounds after determining the gravity of the oil. This method is much more accurate and quicker than when the fuel is weighed, as the average scales are not accurate and then a balance must be taken each time.



FUEL MEASURING TANK.

OXYACETYLENE welding played an important part in repairing the damage done by the German crews of the ships recently taken over by the United States Government. Its inspectors discovered that extensive use had been made of oxyacteylene cutters to partially cut through the joints and hull-plate seams. In almost all the ships interned in New York harbor this had been surreptitiously, but skilfully, done, and the sections cut had been carefully painted over, so that all traces of the work were obliterated. The purpose evidently was so to weaken the hulls and supports as practically to assure the sinking of the steamers when they again put to sea. Fortunately, the damage was discovered, and it is gratifying to know that the scientific welder can thoroughly repair every part injured. The steamer which sustained the most damage was the best of the fleet, the Vaterland, valued at ten million dollars.

The Rusting of Iron Pipe in Service: Theory and Practice*

By Harry Y. Carson

The factors which make for rust resistance of metal pipe have heretofore been given very little consideration in most discussions on the subject. The author believes that the extraordinary qualities of cast iron pipe and fittings can best be explained on the basis of heat treatment as being the only explanation of observed corrosion phenomena.

THE history of pipe is the history of civilization. Upon no other single product have the great cities of the world depended in such large measure for their health and comfort. The modern city is dependent upon pipe as we are dependent upon arteries, veins and capillaries in human bodies. Let us compare our modern buildings to the individual cells in our body. These cells receive their life-renewing supply of wholesome water through multitudinous pipes, permeating every wall and corridor. After the water has supplied life, bathed and cleansed to its utmost, it carries off the waste products through other capillaries, collecting into larger and still larger main trunk arteries. We are taught that man has a natural life of three score and ten years, but would he not have a life of only five years if his capillaries were constructed to last but that long? If his capillaries were built on the century basis and his arteries on the ten-year basis, what would be the ultimate result?

Cast-Iron and Wrought Pipe Compared.

Pipe made in a rolling mill does not resist corrosion in service so well as pipe made in a foundry. Both kinds of pipe may have been made from the same quality of iron ore: both are smelted and both may have been treated in the same manner up to a certain point in their refinement, known as the "pig iron" stage. The iron which passes through a tube mill must first of all be rendered comparatively free from carbon, silcon, sulphur, phosphorus and manganese before it can be manipulated into thinly rolled sheets for the purpose of making wrought pipe. Paradoxical as it may seem to the layman's mind, the question of chemical refinement plays small part in comparison to other factors. These factors which make for rust resistance of metal pipe have heretofore been given little consideration in the many discussions that have taken place on this subject. Pipe or fittings made of cast steel last quite as well as ordinary gray cast iron in service, but conversely the pipe which may have been rolled out from a cast steel ingot lasts not one-tenth as long as the cast product. Now why should this be so?

Perhaps further light on this very involved question can be found in a recent investigation by a prominent tin plate manufacturer, who tried to ascertain the reason why the old iron links of the suspension bridge at Newburyport, Mass., have so successfully withstood the elements of wind and rain for more than one hundred years, little attention having been given to painting or protecting the metal. In reference to this, the following statement is made in The Corrosion of Iron, a book published in 1916 by L. C. Wilson:

> To explain how or why these (links) have so successfully withstood the attacks of air and moisture for so many years is not as easy as it might seem for apparently some of our commonly accepted notions and theories as to what a good iron should and should not be do not hold, or at least are offset by other conditions. For instance, some of the links of the Newburyport bridge have been examined and found to be of very ordinary purity and of a most heterogeneous structure, segregation of the impurities being decidedly noticeable. The question of any inherent superiority in the iron itself was settled by heating and rolling one of the links into a sheet and exposing it to the weather, when it was found that it corroded quite as readily and extensively as the rolling mill product of to-day.

Structure of Cast Iron and Rolled Iron

At the top of the chart (not shown), which is a drawing reproduced from a standard text book on metallography, there are indicated the various commercial grades of iron products which are familiar to all. Beginning with the pig iron on the extreme right, it will be noted that the carbon content is greater than 4 per cent. Next comes gray iron, with a carbon content of 3.2 to 4.6 per cent. White iron is next, with a carbon content of 2.2 per cent. to 3.2 per cent. The iron which has a carbon content less than 2 per cent. is known as steel, and this material may be rolled or manipulated, while all other classes of iron must be cast into the desired shapes or objects. Glancing at the extreme left hand side of the chart, the various temperatures at which iron melts and freezes or solidifies may be observed. These temperatures are somewhat lower for gray iron than for steel, and are yet higher for pig iron than for gray iron. However, these very high temperatures, above 2200 deg. F., apply only to the cast irons and cast steels, for when we begin to investigate the temperatures at which steel pipe and wrought iron pipe are made, we must confine our attention to that part of the chart below 1600 deg. F. and between the limits 0 and 0.1 per cent. carbon. This metal is worked at more than 1000 deg. F. below its freezing temperature, and hence does not attain its full crystal growth which can be restored to the internal structure of the pipe only by remelting.

As a result, the pipe so made displays a form of flaking or exfoliation of its particles under the corrosive influence of ordinary service conditions. A very good analogy to iron rusting can be found in the geological structure of various grades of stone found on the earth's surface. Those stones, such as granite,

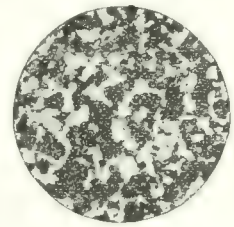


FIG. 1. PHOTOMICROGRAPH OF CAST IRON SHOWING BONDING OF CRYSTALS.

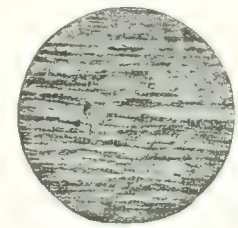


FIG. 2. PHOTOMICROGRAPH OF COLD ROLLED METAL SHOWING LAMINATED STRUCTURE.

which were molded or "cast" ages ago at a very high temperature are far more durable than such materials as sandstone, which were laid down and cemented together after the earth's surface had cooled to a low temperature. Both kinds granite, if we but supply a sufficient amount of heat to fuse together the aggregate mass of silica crystals. Figure 1 is a photomicrograph of cast iron, showing the bonding of the crystals.

Contrary to what has so often been stated with regard to cast iron owing its life altogether to a "skin" resulting from the casting process, the author must diametrically disagree for the simple reason that castings have been in service for more than two hundred and fifty years and have shown no greater loss wherever the original casting skin has been totally absent.

The effect of rolling and re-rolling is even more noticeable under the microscope than is the effect upon the internal structure of rolled steel. A bar of metal which is rolled or drawn "cold" will, if the process be carried to the extreme, present a structure viewed parallel to the direction of drawing, like the photomicrograph shown in Figure 2. However, the pipe made from wrought iron is made at a final heat treatment of approximately 1200 deg. F. which gives a

*Read before the American Water Works Association at New York.

fair degree of fusion to the grain [illegible] particles contributes strength and keeps from wash[illegible] the pipe is made. The [illegible] inhibiting properties of this clay, when carefully distributed through the wall section of the pipe, compensate for the low temperature at which vitrified [illegible] pipe is fired. Nevertheless both wrought iron and steel pipe [illegible] approximately the same useful life regardless of service.

[illegible] that the ordinary quality of cast iron pipe and of cast iron fittings can best be explained on the basis of heat treatment. At least it is the only explanation that seems to coincide with all of the observed corrosion phenomena which are incidents in the rusting of pipe in service.

Theories of Corrosion

The many experimenters who have investigated the subject have evolved at least three different theories of iron pipe corrosion.

The hydrogen-peroxide theory explains the phenomena of rusting by assuming that when iron, water and oxygen are in contact, a chemical reaction takes place in which ferrous oxide, FeO, and hydrogen peroxide, H_2O_2 are formed. Then the ferrous oxide is supposed to react with a portion of the hydrogen peroxide to form a basic or hydrated oxide; rust, an insoluble basic oxide, is the final product.

A second theory, known as the carbonic acid theory, holds that rusting is always started by an acid. It assumes that even a very weak carbonic acid will first convert a portion of the iron into a ferrous salt, with the escape of hydrogen. Under the influence of exygen and water, the ferrous salt is oxidized to ferric hydroxide $2Fe(OH)_3$. The ferric hydroxide is insoluble and upon precipitation the original carbonic acid is liberated. The carbonic acid is then free to attack more iron and to repeat the process of reducing the iron to rust.

The third, and perhaps most important, theory of iron corrosion is known as the electrolytic theory. It rests on the assumption that when water comes into contact with an iron surface, a certain amount of the iron goes into solution. This small amount of iron carried in solution in the water produces an electrolyte. The process of rusting is then explained by the familiar galvanic electrolysis which takes place between the points of high and low potential on the surface of the metal. The modern conception of the reactions which take place holds that they are accompanied by certain readjustments of the electrical state of the reacting irons and the iron must go into solution as a ferrous iron before it becomes oxidized.

If it were possible to summarize all of the painstaking research that has been carried on by investigators since 1880, we would probably find that one common point has always been mutually agreed upon. It has always been admitted that the iron particles must be in direct contact with oxygen and moisture before rusting can take place. In all likelihood, it is probably close to the truth to say that under varying conditions of service for iron pipe, any one or all of the corrosion theories actually apply during the process of rusting. As for inhibiting or preventing the rusting of an iron pipe line, the problems, both theoretical and practical, seem to sum up in the one proposition of keeping moisture and oxygen from reaching the iron itself. Expressed in different terms, it is the old question of getting a protective coating on all exposed parts of the pipe.

Protective Skin on Cast Iron

There is an entirely different kind of surface rust formation on cast iron pipe than is to be found on the surface of a pipe made of rolled iron and steel. On the surface of a cast iron pipe, whether machined or fractured or not, may be observed a reddish brown coloured iron oxide which is very hard, and so tenaciously covers the surface of the pipe that it penetrates down between every surface crystal and forms a perfectly impervious coating which is not penetrated by the moisture and oxygen. Hence galvanic action stops on such a surface and the life of the pipe is insured by the very virtue of the oxide itself contained on the surface.

On the other hand, let us observe the surface of a piece of wrought iron pipe or a piece of steel pipe. In this case we see a loose scaling formation of rust which is soft and pervious to moisture and oxygen. These flakes of rust are very readily removed with a pen-knife or the thumb nail from the surface of the pipe. Once the rust scale drops away, the fresh bright particles of the iron are exposed to the oxygen and moisture so that further rusting takes place on each fresh surface until the entire wall thickness of the pipe has been destroyed. The surface scales on wrought iron materials accelerate galvanic action, whereas the rust formation on cast iron has just the reverse quality, namely, the prevention of galvanic electrolysis. The cause for the gradual slowing up of rust action on cast iron seems, therefore, to be thoroughly explained by the quality of the surface oxide.

Plumbing and Wasted Water

The part which bad plumbing plays in the enormous waste of public water is a very significant reason why water works officials should pay more attention to the details of the piping installed in the buildings. The habit has been too common of thinking that the responsibility ends at the corporation cock on the street main or at the meter. That responsibility should not end short of the spigot on each plumbing fixture.

The New England Water Works Association received last year an excellent report on service pipes, in which the following table was given to show the comparative life of some materials which have been used:

	Years Before Trouble Begins	Life of Pipe Years
Plain iron or steel pipe.....	12	16
Galvanized pipe	15	20
Lead pipe	10	35
Lead lined pipe	10	23
Cement lined pipe	14	28

These data are valuable as giving some idea of the amount of water wasted from steel and wrought iron service pipes, which wastes through rust holes in the pipe long before the trouble is detected. Moreover, it becomes difficult to learn the amount of wastage until the line is torn up and replaced. The table also shows that galvanized pipe is little better than black pipe.

Cast iron pipe for service line in the streets as well as for the mains has been installed at low cost, and perfect results can be obtained provided satisfactory joints are used. The minimum size should be 2 inch internal diameter, and this can be laid at approximately the same cost per foot as 1 inch lead service pipes. Nothing will ever reduce the economic loss from wasted water, amounting to $4,000,000 in the United States annually, so much as the general adoption of cast iron pipe with joints capable of remaining permanently tight. Such piping should begin at the pumping station and continue as far as the plumbing fixtures in the buildings. For pipes less than 2 inches internal diameter the material should consist of brass or copper. The general rule should be to use 2-inch cast iron service pipes, but it is not necessary to provide more than a ¾ or 1-inch tapping on the main. The meter may also be of 1-inch size on a 2-inch service pipe without causing any appreciable pressure loss due to friction.

In connecting the service pipe to the street main the present practice of using a short lead gooseneck between the cast iron pipe and the brass corporation cock should be followed in order to provide for settlement and expansion. The service piping must have joints which are flexible as well as tight against pressure. Such a joint is on the market.

The bell and spigot ends of the pipe are machined at slightly different tapers and bolts are used for assembling the joint. When the joints have been made tight against pressures the bolts are usually loosened off, and this construction remains permanently tight, as there is no chance of deterioration either at the joint or at any part of the pipe system. The Underwriters' Laboratories have tested and approved for high-pressure fire service the cast iron piping having this joint.

THE European war is materially affecting certain phases of the industrial safety problem in Great Britain. For example, the closing of the ports of the Baltic and the shortage of labor in the neighborhood of Bordeaux have greatly reduced the supply of timber used for props in British mines, a considerable part of which has been obtained, heretofore, from Russia and southwestern France. Shipments from Norway and Sweden are not practicable at the present time. The situation has already become serious, and mining engineers are giving it careful attention. One colliery uses props made from old steel pipes, filled with pieces of wood to strengthen them against collapse. It has been suggested, also, that old steel rails be used.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

DOES A PISTON STOP AT REVERSAL?

A PISTON does stop at reversal and I believe it is possible to slow an engine down so slow that every one will admit that it does. Of course, external power would need to be used to run it at such a speed. Now if it actually stops while the fly wheel is turning very slowly, it must also do so at faster speeds. The fly wheel and shaft upon which it revolves have different motions. The outside edge of the wheel travels the faster, but in a constantly changing direction. The speed decreases from the edge to the centre of the shaft where there is no speed but a constantly changing of position, so no matter how slow the wheel moves no part of it or the shaft to which it is firmly fixed can be said to have stopped.

Move a wagonwheel over a knife-edge, and although there is no motion where the wheel is in contact with the knife edge, there is a constant changing of position the same as in the centre of the shaft, so that no part of the wagon wheel can be said to have stopped.

If a solid body does not change its shape, it is impossible to move one part without moving the whole. One end of a spring can be held at rest while the other part moves. So also with an auto tire, when a given point on the face of the tire comes in contact with the ground the spring of the tire allows that point to stop while other parts are in motion. Some part of an auto tire therefore is at rest all the time while no part of a steel wagon tire rests as long as the wagon moves.

W. D. BOOKER.

EFFICIENCY AND PRODUCTION

By R. Hamilton

IN the drawing up of a contract it is essential that the parties involved be agreed on the terms, otherwise there is no contract. Mutual understanding is necessary before an agreement can be successfully carried out, and it is only by the meeting of minds that the interests of the several parties can be properly safeguarded. The extension of this principle, which in the past has been largely confined to the actual drawing up of contracts, must eventually spread to the operation of industrial plants, not alone as regards the duties of the chief executives, but also to the heads of the different departments and their various assistants. A contract is often entered into and afterwards regretted by either of the contracting parties; not that one or the other is at fault but because local disorganization is sometimes created by the methods adopted to achieve a certain result. Essential as the formation of a contract may be, it is equally important that this fundamental principle —the meeting of men and minds—be extended to the actual production of manufacturing. It is not reasonable to believe that the brains of any establishment are contained in the head of any one man, no matter what position he may hold; while it is also understood that a chief executive is indispensable, together with the heads of the various departments. It is this very important feature of plant management that emphasizes the necessity of periodical meetings or conferences of the different department heads, so that all may be advised, in a general way, of the efficiency of each division, together with the difficulties that often arise in operating details. The highest efficiency is only attainable when perfect harmony exists throughout every department.

Factors Necessary To Success

Three essentials are required to maintain a state of equilibrium in any line of manufacture; the designer or construction engineer must be familiar with the plant equipment so as to avoid complications in productions: the building or producing staff should be acquainted with the purposes of the designing engineers; and the product must conform to the wishes or specifications of the user or consumer. Like the sides of an equilateral triangle these three factors are fundamental to the stability of the whole; each section performing its own particular function, but the three united and acting in harmony to maintain equilibrium. Designs are often prepared in the drawing office for certain work without a thought as to the facilities that are available for the actual production of the piece; patterns may be made, parts may be cast or forged, and not until they have reached the machine shop will it be discovered that the shop equipment is not suitable for the effective production of the work. In a large establishment such contingencies are not so pronounced owing to the wide range of machine equipment; but in the smaller plant it often happens that additional expense is entailed by the lack of sufficient forethought or mutual understanding between the designing and production departments. Too frequently the designer will concentrate his efforts on the use a certain part is to be put to, without due consideration to the machines that are available for the production of the piece.

A case in point was that of several hand wheels that had been designed with a side boss, the end of which extended an inch and a half beyond the outside diameter of the rim. The diameter of the wheel proper was 13 in., but with the boss it required a lathe with a swing of 16 in. to allow the protruding section to clear the shears of the bed. The shop was equipped with one 20-in. and several 15-in. lathes, but the large machine was over-supplied with work, while insufficient jobs kept the 15-in. lathes idle part of the time. The first six of these hand wheels were finished in the larger lathe, but before casting any more, enough of the extending boss was removed from the pattern to allow of using the smaller lathes for the succeeding wheels. This is only one of many instances that might be recorded to demonstrate the lack of co-operation on the part of plant organizations to attain that state of maximum efficiency that is frequently tried for, but seldom achieved. This desired objective, however, may be more fully realized by the regular and conscientious meeting of department foremen and plant executives, so that mutual discussions will enlighten each other as to the important shop features that are fundamentally essential to the successful operation of any industry.

ENCOURAGING THE PRACTICAL

By J. H. R.

ONE can very well understand that world conditions as they exist to-day are productive of inventive epidemics The patent offices are crammed with applications for patents or protection on thousands of devices and processes; the bulk of those submitted during the past two or three years being in connection with defensive or offensive war appliances. While many of these "inventions" are no doubt of practical value, the greater number might be classed as fantasies of a fevered brain—visionary possibilities devoid of the essential requirements necessary to achieve the realizations of their specified claims. On the other hand, there must be many of those submitted, not only to the patent office, but to such boards as are appointed to investigate such matters and pass upon their merits or demerits, that are subsequently given favorable consideration, as being likely to fulfil the claims advanced in the specifications. It is probably true that a great deal is being done to accept and apply any suggestion or idea that will aid in combating the efforts of the opposing parties, but is every possible method being adopted to rapidly perfect those ideas that are deemed worthy of serious consideration? Is it sufficient for a board of selected men to pass on the merits of a certain invention, without consulting and obtaining further details from the originator of the idea? A wrong conception hastily taken may sometimes condemn a highly efficient device; or the want of accurate knowledge pertaining to certain mechanisms may place the "idea" on the shelf for an indefinite period.

Recently a highly efficient technical and practical engineer perfected a cer-

[illegible] had received careful consideration, but for stated reasons was deemed impracticable: and in addition, he was credited with sending an invention that did not conform with what he actually did submit. From this, one might imagine that the boards are not properly equipped with the skilled information necessary to thoroughly investigate the possibilities of such devices.

Present circumstances will not allow of any delay in developing, as rapidly as possible, any idea that looks reasonably certain of success. Under these conditions every facility should be given to the originator of a practical idea to develop it to the point where it will demonstrate its practical worth. The cost of equipping a plant and allowing the actual inventor to perfect the original and often crude conception of what his mind or hand has accomplished would not be prohibitive, and the returns would undoubtedly repay the expenditure involved. The number of "possible" inventions would not be so large but that the Government could well afford the outlay necessary.

INDUSTRIAL ALCOHOL

THE problem of a future supply of gasoline is yearly becoming more acute, in fact the question of finding a substitute for petroleum itself is recognized as being a matter of a few years only. Just when circumstances will justify efforts to establish an alcohol industry cannot be very well decided till the influence of war conditions has been removed. Discussing the prospects of producing industrial alcohol in this country, W. J. Dick, writing in the Canadian Mining Institute Bulletin, states that imports of petroleum and petroleum products into Canada have been rapidly increasing, while the domestic production has been decreasing. The imports of petroleum, crude and refined, during the calendar year 1914 totalled nearly 244½ million gallons valued at over $11,000,000. As our crude petroleum production in 1914 amounted to about 7½ million gallons, valued at about $344,000, it can be seen that Canada is dependent upon foreign sources for her supplies of petroleum and petroleum products. The production of crude petroleum has come almost solely from Ontario and is steadily but surely declining in spite of attempt being made by drilling to enlarge the areas of producing fields, or to find new ones.

In considering the development of a substitute for petroleum for certain purposes such as illumination, cooking and for use in internal combustion engines, industrial alcohol, which is used to a considerable extent in Germany and Great Britain, is suggested.

In 1914, the imports of refined and illuminating oil amounted to over [illegible] gallons, valued at $2,000,000, while the same year 34,000,000 gallons of gasoline, valued at $2,747,000 were imported. If industrial alcohol could be produced [illegible] to replace these products there would be a saving of over 3½ million dollars worth of imports. On account of the rising price of gasoline it has been reported that many tractors have been rendered idle in the Prairie Provinces, thus reducing the acreage to be sown. Some people are of the opinion that the high cost of gasoline is occasioned by the present war, but the Director of the United States Bureau of Mines declares that the prevailing prices may not only continue for some time, but will undoubtedly reach higher levels before there is any permanent relief. He states that the United States Government will, during the next fiscal year, pay 31½ cents for its gasoline. He, therefore, concludes that, if the United States, using such vast quantities, is compelled to pay this high price, the private consumer will have to pay much more. Furthermore, at the present rate of production, the known supply of crude oil in the United States, from which we are getting our present supply of gasoline, will be exhausted in 27 years.

In considering the establishment of an alcohol industry in Canada, it is necessary to distinguish war conditions from those obtaining in normal times. As alcohol is essential in the manufacture of smokeless powder, present prices are abnormally high; whereas, under normal conditions, there is not the great demand for alcohol for this special purpose and it would then have to compete with kerosene and similar products.

The raw materials used elsewhere than in Canada for the manufacture of industrial alcohol are potatoes, sugar beets, molasses, and sawdust.

The present price and yield of potatoes in Canada are not such as would warrant the founding of a potato alcohol industry in Canada. The British Committee on Industrial Alcohol reported that it would not be possible to establish potato-alcohol industry in Great Britain unless potatoes were less than 29 cents per bushel. W. T. Macoun, Dominion Horticulturist, states that, if best methods are followed, 300 bushels of potatoes per acre can be produced. He estimates the cost of production and marketing such a crop of 20½ cents per bushel but says that this will be reduced on large areas where the most modern machinery is used. *The Census and Statistics Monthly* states that the profit per acre, in 1913, for spring wheat grown in Manitoba, Saskatchewan and Alberta was $2.65, $1.72 and $2.09 respectively, so that it is evident that if potatoes were sold at 21½ cents per bushel there would be a greater profit to the farmer than growing wheat in these provinces.

Potatoes used in the manufacture of alcohol need not be sacked and may be shipped frozen with but a trifling loss.

The establishment of an alcohol industry on a suitable scale would be, as outlined previously, a means of carrying on profitable agriculture in areas otherwise unsuited to crop growing; the feeding of the spent mash to cattle would encourage live stock growing and the alcohol produced could be consumed by the farmers as illuminant, for cooking and heating purposes, and as a source of motor fuel.

U. S. POLICE TO PREVENT FACTORY OUTRAGES

THE serious losses sustained by the Allies through incendiarism has proved an incentive for the recent enactment of legislation by the United States Congress, designed to cope with the situation.

The Bureau of Mines, Department of the Interior, has been charged with the enforcement of the principal clause in the war measure, which deals with the possession of high explosives and is substantially as follows:

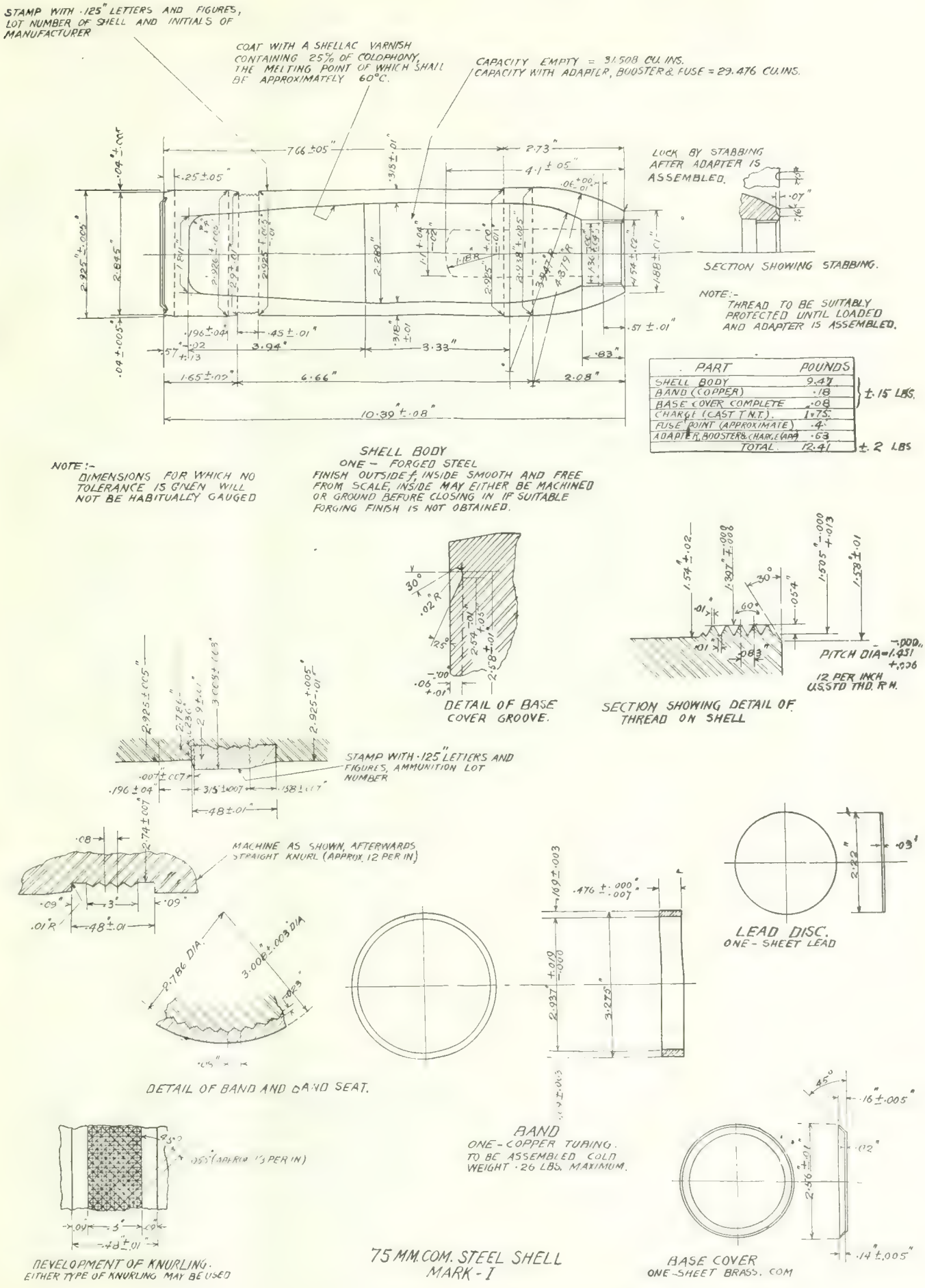
Any person in the United States found with explosives in his possession after November 15 and who does not have a license issued by the Federal Government stating the purpose for which the explosives are to be used, will be at once arrested and fined not more than $5,000 with the alternative of imprisonment for one year. If the circumstances warrant the person may be fined and in addition given the one year in prison.

The co-operation of the organized police of the country is enlisted in the work, and they are authorized not only to look after the enforcement of the law, but also to make thorough investigation of all dynamite outrages and fires in factories, warehouses, etc., and to make their reports to the Director of the Bureau of Mines.

75 MM. U. S. SHELL

ON the following page is reproduced a line drawing of the U. S. 75-millimetre high explosive shell, giving all the constructional dimensions required to enable prospective manufacturers to consider the production problems involved. The provision of a base protecting plate, walls of comparative thinness, a nosed-in mouth, and the acceptance of a forged interior finish are among the principal features of the design. The knurled band seat is already familiar to many of our readers through Russian work.

The design may be accepted as representing the most complete compromise between ease of production and efficiency in use. The thinner walls increase the explosive containing capacity—the forged construction economizes metal in manufacture, and, when sufficiently high grade to dispense with interior finish, will result in a considerable saving of time in machining. Knurling and absence of undercutting on band groove simplify tooling equipment and reduce upkeep. The extra operation of nosing, as compared with the British shell, is not objectionable in view of the other features referred to.


STAMP WITH ·125" LETTERS AND FIGURES, LOT NUMBER OF SHELL AND INITIALS OF MANUFACTURER
COAT WITH A SHELLAC VARNISH CONTAINING 25% OF COLOPHONY, THE MELTING POINT OF WHICH SHALL BE APPROXIMATELY 60°C.
CAPACITY EMPTY = 31.508 CU. INS.
CAPACITY WITH ADAPTER, BOOSTER & FUSE = 29.476 CU. INS.
LOCK BY STABBING AFTER ADAPTER IS ASSEMBLED.
SECTION SHOWING STABBING.
NOTE:- THREAD TO BE SUITABLY PROTECTED UNTIL LOADED AND ADAPTER IS ASSEMBLED.
PART POUNDS
SHELL BODY 9.47
BAND (COPPER) ·18
BASE COVER COMPLETE ·08
CHARGE (CAST T.N.T.) 1.75
FUSE POINT (APPROXIMATE) ·4
ADAPTER, BOOSTER & CHARGE (APP.) ·63
TOTAL 12.41
± .15 LBS.
± .2 LBS
NOTE:- DIMENSIONS FOR WHICH NO TOLERANCE IS GIVEN WILL NOT BE HABITUALLY GAUGED
SHELL BODY
ONE - FORGED STEEL
FINISH OUTSIDE & INSIDE SMOOTH AND FREE FROM SCALE, INSIDE MAY EITHER BE MACHINED OR GROUND BEFORE CLOSING IN IF SUITABLE FORGING FINISH IS NOT OBTAINED.
DETAIL OF BASE COVER GROOVE.
SECTION SHOWING DETAIL OF THREAD ON SHELL
PITCH DIA=1.451
12 PER INCH U.S.STD THD. R.H.
STAMP WITH ·125" LETTERS AND FIGURES, AMMUNITION LOT NUMBER
MACHINE AS SHOWN, AFTERWARDS STRAIGHT KNURL (APPROX. 12 PER IN.)
DETAIL OF BAND AND BAND SEAT.
LEAD DISC.
ONE - SHEET LEAD
BAND
ONE - COPPER TUBING. TO BE ASSEMBLED COLD. WEIGHT ·26 LBS. MAXIMUM.
DEVELOPMENT OF KNURLING. EITHER TYPE OF KNURLING MAY BE USED
75 MM. COM. STEEL SHELL MARK - I
BASE COVER
ONE - SHEET BRASS. COM

CONSTRUCTIONAL DETAILS OF THE UNITED ST ATES 75-MILLIMETRE HIGH EXPLOSIVE SHELL.

PROGRESS IN NEW EQUIPMENT

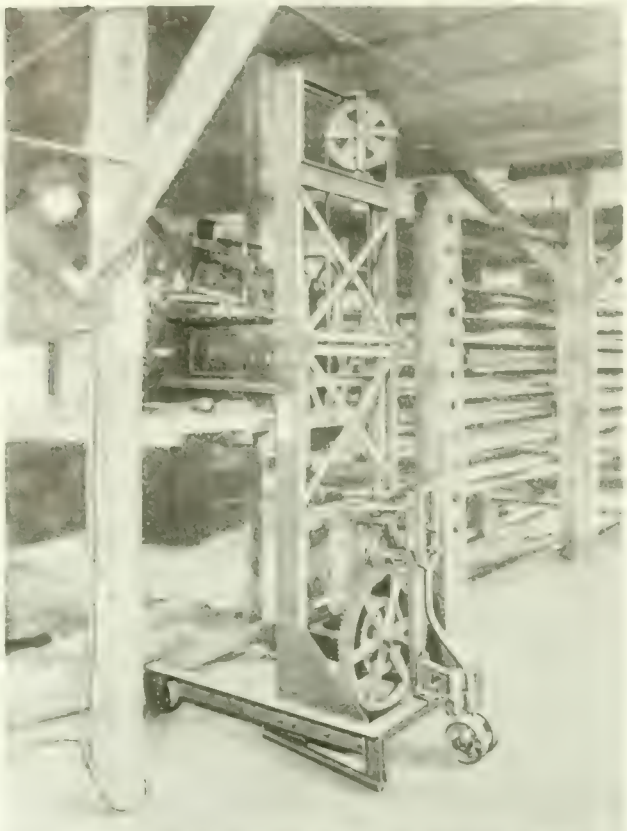
A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

FOR STOCK ROOM USE

THE [illegible] item.

The Mechanical Appliance Co., Milwaukee, Wis., [illegible] motor-driven hack saw to the pile of shafting.

A standard tiering machine, shown in the accompanying engraving, is utilized for raising the platform which carries the saw to the correct level of the shafting. One operator is able by means of this arrangement to take care of the complete cutting off of the shafting. As many as six men were formerly employed to carry long pieces of the heavier sizes of shafting to the saw.



UNIQUE ADAPTATION OF TIERING MACHINE AND HACK SAW FOR THE ECONOMICAL CUTTING OF SHAFTS WITHOUT REMOVING FROM STOCK RACKS

Its use has effected considerable saving in time and money, the economy and adaptability of the apparatus to many plants being obvious.

PLAIN VISE FOR MILLING MACHINES

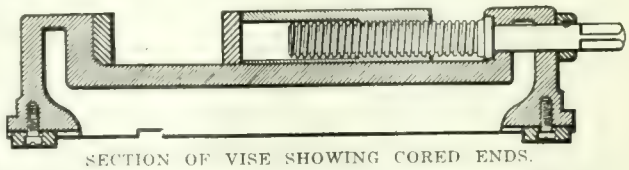
THE plain vise shown in the accompanying engravings is a product of the Cleveland Milling Machine Co., Cleveland, O., who have endeavored to eliminate certain objectionable features of previous vise construction.

To facilitate the interchanging and settling of vises when used as jigs or fixtures on milling machines, the tongue slot in all vises is accurately milled an exact distance from the face of the solid jaw, thus allowing one vise to be loaded or unloaded while the cutters are working on the piece or pieces in the other vise.

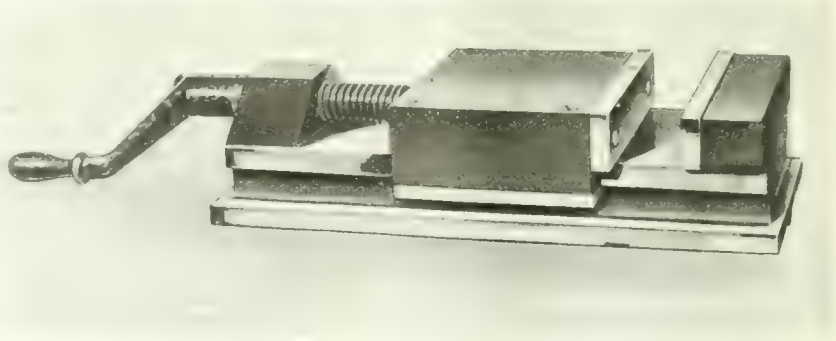
Ample clamping surface is provided by a machine-finished flange on all four [illegible] of inserting special jaws for holding irregularly shaped pieces. The movable jaw is gibbed around the outside and the diameter of the screw is as large as is consistent with the height of the vise.

In casting the base of the vise, cores [illegible] are set in the end pieces—the solid jaw and screw bearing parts—and this practice effectually eliminates the shrinkage crack which occurs when the comparatively large amount of metal cools in a solid casting, and hence reduces the liability of cracking at these points of stress.

The regular equipment comprises one pair of clamps and bolts, one crank handle and hardened and ground tongues, the complete outfit in shipping form weighing 60 pounds.



SECTION OF VISE SHOWING CORED ENDS.



PLAIN MACHINE VISE OF LOW DESIGN WITH MACHINED FLANGE.

TWO-SPEED CHAIN HOIST

THE accompanying illustrations show the mechanical construction of the Simplex chain hoist, one of a line of hoisting specialties manufactured by J. G. Speidel, Reading, Pa., a novel feature of the apparatus being the simple and ingenious method of securing two speeds.

An endless hand chain is laid over the large chain wheel, which, in connection with a pinion and a brake wheel with ratchet teeth in the outer rim, form the automatic brake, which keeps the load from running down. These three parts, when put together, are handled like one piece, and turn loose on the reduced extension of the main shaft.

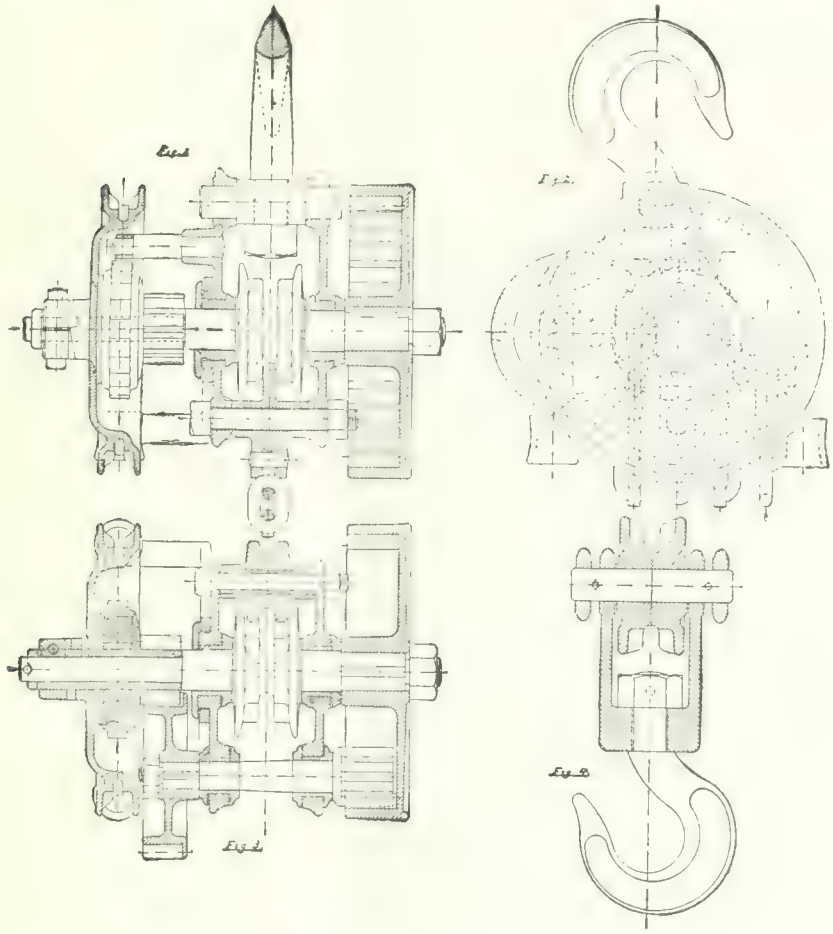
The pinion attached to the hand chain wheel drives a spur gear, which is keyed to a second shaft, at the end of which is another pinion, which engages with the teeth of an internal spur gear, which is keyed to the opposite end of the main shaft, to which is attached the lift chain wheel. Thus, by means of two pairs of spur gearing, motion is transmitted from the hand chain to the lift chain. By pulling on the hand chain, in one or the other direction, the load is either lifted or lowered.

In hoisting the load the brake wheel, with its ratchet teeth on the outer rim, revolves freely with the hand chain wheel and pinion, not causing any resistance, the ratchet pawl running freely over the teeth. As soon as the pull on the hand chain ceases, the pawl engages with the ratchet teeth on the brake wheel, keeping it from running backward, and so keeping the load suspended.

In lowering the load the hand chain is pulled in the opposite direction, and a slight pull is sufficient to overcome the friction of the automatic brake, thus allowing the load to descend and holding the same suspended again as soon as the operator stops pulling on the hand chain. By a continuous pull on the hand chain the load can be lowered at a good speed.

Features of the design which make for positive action and flexibility of control are as follows: A pawl arrangement in the lower block, which locks the hoisting chain to the sheave, allowing light loads to be hoisted at double the speed used when working to capacity load; the guides through which the hand chain passes are closed rings attached to a swinging frame, which permits them to take up the position of least resistance when the chain is pulled at any angle, thus allowing the operator to stand well out from beneath the hoist without imposing undue wear on the chain and guides; the lift chain is prevented from jumping over the sprocket of the lift chain wheel by means of a guide roller, and a stripper, which runs up through the narrow groove of the lift chain wheel prevents the chain from sticking to the wheel.

This hoist is supplied in capacities ranging from 1,000 pounds up to 40,000 pounds, and it is claimed that one man can lift any load up to 16,000 pounds, above which two men are required.



TWO-SPEED CHAIN HOIST.

DOMINION REVENUE INCREASE

THE Dominion revenues for the seven months of the fiscal year ending Oct. 31, totalled $145,719,060. For the same period last year they were $121,767,808. The increase was largely due to customs collections, which jumped from $75,191,250 to $91,763,123. Expenditures on ordinary account for the seven months totalled $66,644,227 as against $57,561,116 in 1916. Expenditures on capital account reached the sum of $144,213,352, of which $133,254,798 was due to the war, and $10,599,242 was on account of public works. Last year the war expenditure for the same period was $127,487,147, and the public works expenditure $13,540,236. The total for same period last year was $141,390,862. The war expenditure for the month of October was $45,481,940. The total net debt of the Dominion on Oct. 31 was $948,236,872, an increase of $47,227,371 for the month of October.

Screenings

The latest story about the Bishop of London concerns a week-end he spent recently at a friend's house in the country.

On the Monday morning he was playing tennis with his host's son, a young officer home on short leave from the front, with whom he had frequently played before.

Usually the Bishop more than held his own with him, but on this occasion it was not so.

Between games he remarked to his opponent:

"I simply can't stand your service today."

"Then we're quits," was the cheeky reply. "I couldn't stand yours yesterday."

"AN' hoo's the guid wife, Sandy?" said one farmer to another as they met at the market and exchanged snuff-boxes.

"Did ye no' hear that she's dead and buried?" said Sandy solemnly. "Dear me!" exclaimed his friend sympathetically, "surely it must have been sudden?" "Oh, ay, it was sudden," returned Sandy. "Ye see, when she turned ill we had nae time tae send for a doctor, sae I gied her a bit of medicine I had lying in a drawer for a year or two, an' that I had got frae the doctor for myself', but hadna ta'en. It's a sair loss tae me, but it's something tae be thankfu' for I didna tak' the medicine myself'!"

A zealous policeman caught a cab driver in the act of driving recklessly. The officer stopped him and said:

"What's yer name?"

"Ye'd better try and find out," said the driver peevishly.

"Sure, and I will," said the policeman as he went round to the side of the cab where the name ought to have been painted; but the letters had been rubbed off.

"Aha," cried the officer. "Now ye'll git yersel' into worse disgrace than ever. Yer name seems to be obliterated."

"You're wrong!" shouted the driver triumphantly, " 'Tis O'Sullivan."

The steamer was just putting off from the pier when a stout gentleman came tearing along, flourishing his stick and shouting excitedly:

"Stop! Put her back—put her back! There's a party—between 60 and 70—wanting to go."

The captain, seeing that there were very few passengers aboard, thought it worth while to "put back."

The old gentleman thereupon stepped on board and collapsed into the nearest deck chair and wiped his steaming brow.

The captain waited, with his eyes scanning the pier.

"How long are they going to be?" he asked. "Where is your party of 60 or 70?"

The heated gentleman looked up in mild surprise.

"Oh," he said. "I'm the party. I'm 65 to-day, sir."

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PETER BAIN, M.E., Editor. B. G. NEWTON, Manager.

Associate Editors
A. G. [illegible] M. WILSON J. H. RODGERS A. V. BURR

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Vol. XVIII NOVEMBER 22, 1917 No. 21

INDUSTRIAL ACTIVITY ANTICIPATES "VICTORY LOAN" SUCCESS

ON every hand, the duty of investing their savings in Victory Bonds is being so strongly impressed on our people that it is almost superfluous for us to add a further word of exhortation. A selling organization unparalleled in the history of the Dominion, supported by the leading business and financial personalities of the latter and backed by the most effective publicity methods—direct and indirect—is carrying the crusade to the most remote corners of the land with conviction to each citizen individually of the necessity of raising the millions aimed at to bring to a successful and speedy termination the world war in which we with our Allies are so deeply involved.

We would like to impress upon our readers, however, apart altogether from motives of duty, the pecuniary advantages to be derived from participation in the loan. As a cold business proposition, investment in Victory Bonds is a most desirable venture, furnishing an opportunity of rarest occurrence and of extraordinary possibilities. The yield, indeed, on these Victory Bonds is so high that some patriots will be inclined to question its necessity. High yields are doubtless desirable in order to make sure of an overwhelming success, but, even so, it is being asked whether, with such a strong selling organization in existence, the loan could not have been floated to quite as good advantage at a less cost to the Government. Be this as it may, the fact remains that the return on the bonds is admittedly high and he would be a foolish investor who would hesitate to take every possible advantage of the opportunity to put out his money on these alluring terms.

There is another side to the Victory Loan. It has been brought home to us in recent months that for the duration of the war at least the wheels of industry in Canada must needs revolve through the power medium of money supplied by her own people. In a word, much business is available for our manufacturing plants—metal-working and otherwise; same is procurable, however, for the most part, only if we bear its financing on our own shoulders in the shape of credit to the Imperial Government.

Munitions making in Canada has for several months been ebbing, and until quite recently had every appearance of becoming a more or less negligible quantity. Realization of the imminence of such a possibility was, needless to say, little relished by our business interests. Investigation of the situation disclosed the fact that financing of munitions orders was the chief obstacle in the way, as a result effort was at once directed to satisfactorily overcome the trouble. Flotation of a Victory Loan of at least $150,000,000 was planned, and while the amount secured to date, with the subscription campaign little more than half way through, is several millions short of the minimum aimed at, ultimate success is already assured, and what is perhaps of greatest importance, the flow of shell contracts on behalf of the Imperial Government has been resumed, and our metal-working plants are beginning to hum with the activity that marked their operation for many months previous to the early spring of this year.

Not only has shell-making been resumed on behalf of the Imperial Government, but contracts of considerable value covering 75 and 155 millimetre shells have been placed in Canada by the U.S. Government. Airplane engine manufacture is a further development of the industrial situation in Canada, and doubtless is also a result of our undertaking the financing of Allied Government contracts. A prominent Toronto firm of automobile manufacturers has secured an Imperial Government order to the value of $5,000,000, covering the supply of Sunbeam "V" type, 8-cylinder, 200 horsepower, airplane engines, and is now busily engaged installing the necessary equipment, which by the way is readily available.

An interesting and added feature of the market section of this and succeeding issues of our journal will be found in our Washington, D.C., letter. Special attention is drawn to same on this occasion, particularly that paragraph referring to the paucity of bids received from United States firms for the supply of 5-inch projectiles. It would appear that opportunities to participate in the distribution of U.S. Government orders are in no sense impossible of being secured, judging from the above.

RAILROAD RATES AND SERVICE EFFICIENCY

THE case of the American railroads—the demand of the carriers for the 15 per cent. increase—has reopened at Washington. Opposition is crumbling under the fire of the fact-proven demands of the carriers that they must have higher profits in order that they may give efficient service. In fact the question now appears to be: How much more than the 15 per cent. will the roads have to be allowed in order that they may play their part in winning the war?

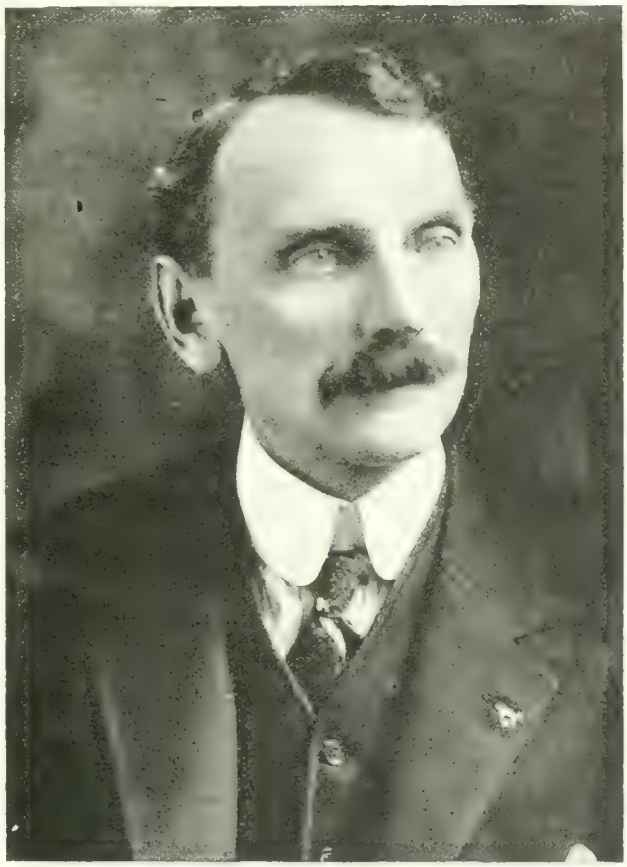
The United States has been in the war a few months. The place of the railroads in the national organization for war-time efficiency is being recognized. Canada has been in the war for more than three years and the Railway Commission, despite arguments that must long ago have overcome any intelligent objections, sits passive while the systems are being so run down that there is serious danger of the whole national machine being seriously interfered with.

If it has been because the advance was refused in the United States that the Canadian Commission has held its hand, that excuse will soon be removed. Canadian business, Canadian manufacturing and Canadian agriculture —although they may be too near sighted to see it—need the maximum of efficiency in transportation service at this time and the starvation of the railroads must cease if they are to give that service.

The high cost of materials of construction of every kind, and the increased wages being paid operators make it a sheer impossibility now to maintain a high standard of efficiency in rolling stock and roadbed equipment, and little doubt is entertained that with a reasonable rate increase, a stimulus will be given railroad betterment, which would be otherwise unobtainable for the duration of the war, and perhaps for many months thereafter.

INDUSTRIAL NOTABILITIES

WALTER LAURIE, vice-president and general manager Laurie Machinery Co., Ltd., distributors of general machinery of all kinds, 335A Craig Street west, Montreal, Que., was born in that city, May 14, 1865, son of John and Jane (Thompson) Laurie. He was educated at the Montreal High School,



WALTER LAURIE.

following which he began his business career with the Laurie Engine Co., Ltd., Montreal, serving them in various capacities from 1882 to 1907. He organized and established the present business in 1907, and has had active charge of its administration and operation since that date.

Mr. Laurie married Elizabeth Tucker, of Newfoundland, 1905. His clubs are confined to the Engineer's, Montreal, and his societies to the A. F. & A. M. (Shriner). The family residence is at 2461 Hutchison Street, Montreal, Que.

Photo, courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

FINISHED IRON AND STEEL

F.O.B. Chicago Warehouse

FREIGHT RATES

	Per 100 lbs. C.L.	L.C.L.
St. John, N.B.	35.1	45.5
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS

	Montreal	Toronto
Spelter	10 50	10 50
Aluminum	60 00	62 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Tank plates, 3-16 in.	13 10	12 10

WROUGHT PIPE

Effective July 5, 1917.

Size	Black Standard Per 100 feet	Galvanized Buttweld Per 100 feet
¼ and ⅜ in.	5 12	7 16
1¼ in.	16 33	20 59
2 in.	26 27	33 12

2 in.	71 76	89 70
4 in.	85 02	
	96 52	
	112 50	
6 in.	145 90	
7 in.		
8 in.	200 00	
8 in.	230 40	
	256 00	
10 in.	60	112 00

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

1" and under, 45%.

Standard couplings, 4" and under,

OLD MATERIAL

Dealers' Buying Prices

	Montreal	Toronto
Copper, light	$19 00	$19 00
Copper crucible	22 50	21 50
Copper, heavy	22 50	21 50
Copper wire	22 50	21 50
No. 1 machine composition	21 00	20 50
New brass cuttings	16 00	17 00
No. 1 brass turnings	15 00	15 75
Light brass	11 00	10 00
Medium brass	15 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	29 50
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	23 00	18 00
Axles, wrought iron	30 00	24 00
Rails	26 00	20 50
No. 1 machine cast iron	25 00	25 00
Malleable scrap	21 00	20 00
Pipe, wrought	15 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	32 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	15 00	8 50
Stove plate	19 00	19 00
Scrap zinc	5 00	6 50
Heavy lead	6 00	7 00
Tea lead	5 00	5 75
Aluminum	28 00	25 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ¾" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 20
Elevator bolts	5
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less.	10
Blank bolts	net
Boat ends	net
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	15
Boiler rivets, base ¾-in. and larger	$8 50
Structural rivets, as above	8 40
Wood screws, flat, bright	72½
Wood screws, O. & R.	67½
Wood screws, flat, brass	57½
Wood screws, O. & R. brass	52½
Wood screws, flat, bronze	47½
Wood screws, O. & R. bronze	42½

MILLED PRODUCTS

	Per cent
Eq. & Hex. Head Cap Screws	20
Rd. & Fil. Head Cap Screws	net
Fin. & Semi-fin. nuts up to 1 in.	25
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	20
Fin. and semi-fin. nuts over 1½ in., up to 2 in.	plus 10
Studs	net
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nut	60
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4 50
Cold pressed nuts over 1½ in.	add $7 00

BILLETS

	Per gross ton
Bessemer billets	$47 50
Open-hearth billets	47 50
O.H. sheet bars	51 00
Forging billets	60 00
Wire rods	57 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$5 50 $5 45
Cut nails	5 70 5 80
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

MISCELLANEOUS

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 15
Putty, 100-lb. drums	4 75
White lead, pure, cwt.	16 55
Red dry lead, 100-lb. kegs, per cwt.	16 25
Glue, English	0 38
Tarred slater's paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal.	0 78
Linseed oil, raw, single bbls.	1 42
Linseed oil, boiled, single bbls.	1 45
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery cloth	list plus 33 1-3
Borax, crystal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Drilling cables, Manila	0 11
Plumbers' oakum, per lb	0 09
Packing, square braided	0 34
Packing, No. 1 Italian	0 40
Packing, No. 2 Italian	0 32
Pure Manila rope	0 39
British Manila Rope	0 33
New Zealand Hemp	0 33
Transmission rope, Manila	0 45
Cotton Rope, ½-in. and up	0 47

POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

CARBON DRILLS AND REAMERS

	Per Cent.
S.S. drills, wire sizes up to 52	30
S.S. drills, wire sizes, No. 53 to 80	net
Standard drills to 1½ in.	30
Standard drills, over 1½ in.	30
3-fluted drills, plus	10
Jobbers' and letter sizes	20
Bit stock	25
Ratchet drills	15
S.S. drills for wood	30
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	net
Drills and countersinks	list plus 30
Bridge reamers	52½
Centre reamers	10
Chucking reamers	net
Hand reamers	10

COLD ROLLED SHAFTING

At mill list plus 40%
At warehouse list plus 50%
Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Canadian malleable, A, add 35%; B and C, plus 25%; cast iron, net; standard bushings, 25%; headers, 60; flanged unions, 5; malleable bushings, 30; nipples, 45; malleable lipped unions, 40.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$9 50	$ 9 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B.W.G.	11 75	10 75
Fleur-de-Lis, 28 B.W.G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	10 20
Premier, 10¾ oz.	13 85	10 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
⅞ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

1/8 in.	$15 50
3-16 in.	11 70
1/4 in.	8 40
5-16 in.	7 40
3/8 in.	6 35
7-16 in.	6 35
1/2 in.	6 35
5/8 in.	6 35
3/4 in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	40
Black Diamond	40
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	37½
Disston	50
Whitman & Barnes	50

COAL AND COKE.

Solvay Foundry Coke	
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto.

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3¼ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	10%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White.	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

Colored.	
Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	41 to 46
Tin	49 to 55
Zinc	23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14 x28 in., 14x60 in	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base	64 00	60 00
Braziers', in sheets, 6 x 4 base	55 00	52 00

BRASS.

Brass rods, base ½ in. to 1 in. rod	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	06
Emery glue	15 to 20
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	15
Acid, hydrochloric	05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	.05
Ammonia, aqua	08
Ammonium carbonate	.15
Ammonium, chloride	.11
Ammonium hydrosulphuret	10
Ammonium sulphate	.07
Arsenic, white	12
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt, sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.55
Sodium bisulphite	.10
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices per lb. unless otherwise stated.

Market Condition and Tendency

MORE orders for shrapnel have been placed by the Imperial Munitions Board, which is additional evidence that the revival in the munitions industry is an assured fact. Further orders for 6-inch shells are likely to be placed by the Board within the next few months. The machine tool business has brightened up considerably and there is a good demand for equipment for shell plants. There have been more enquiries for second-hand tools and the market is again being cleaned up of this class of equipment. The Dominion Government has prohibited the exportation of iron and steel except under license from the Customs department on account of the serious shortage. This step had to be taken in order to relieve, as far as possible, what has developed into a serious situation intensified by the embargo on iron and steel from the States. The Canadian embargo affects pig-iron, steel ingots, billets, blooms, rods, bars and shapes. Prices of black sheets in the lighter gauges and galvanized sheets have again declined, while steel plates are also lower due to the easier situation in these materials in the States. Prices of other steel products are unchanged and remain firm in the meantime. The pig-iron market remains firm and situation unchanged. The position of the non-ferrous metals is practically the same as last week. In spite of the heavy demand for copper there appears to be enough of the red metal to satisfy the demand, although the smaller consumers are having some difficulty in obtaining supplies due to the delay in distribution. The scrap situation is unchanged; both buyers and sellers are exhibiting a disposition to await developments owing to the unsettled condition of the market.

MONTREAL, QUE., Nov. 19, 1917.—Every effort is being put forward to make the present Victory Loan one of the greatest financial achievements in the history of the Dominion. Every branch of commercial and industrial activity is engaged in the task of making this undertaking a huge success; the Canadian metropolis has just experienced the greatest patriotic demonstration since its inception as a city—and, if enthusiasm is any indication of material backing, the success of the loan is already assured. The appropriation of the money raised will eventually mean greatly increased industrial activity and we trust be the means to a more speedy ending of present hostilities.

Steel

The steel situation is practically unchanged, the market being still influenced by the effect of the recent price fixing, which has now been made on nearly every important commodity or raw material. Price regulations for the past week were those on iron bars and rivets, the quotation on the former being set at 3½ cents per lb., Pittsburgh; this being a decline of 1¼ cents on the prices recently quoted on the open market. The adjusted price on rivets, both structural and boiler, is now $4.65 per hundred lbs.

Interest at present is centred in the munitions contracts being placed in Canada for large quantities of American shells. It is expected, however, that the steel required for these orders will come from the States. Hopes are entertained that the success of the Victory loan will place sufficient funds at the disposal of the Canadian Government to ensure that the production of British

munitions will be materially revived and renewed stimulus be given to the industrial activity of the Dominion. Such action would again center the demand upon Canadian steel mills and foundries. American Government requirements dominate the steel situation to the extent that material for domestic purposes is almost impossible to obtain. The Canadian situation shows no new developments, dealers reporting firm but unchanged quotations.

Metals

The market generally has no features of interest as complex conditions tend to place consumers and dealers in a passive mood, awaiting further developments. Copper conditions are still shrouded in mystery, with outsiders uncertain of their position. Tin is scarce and higher. Spelter is quiet but firm. Lead is steady with a stronger tone. Antimony and aluminum are both unchanged.

Copper.—A complex situation still features the copper market, with producers claiming that the available supply is inadequate to the demands from all quarters. The requirements of the American Government are receiving the first consideration and domestic consumers are still in the dark regarding the possibility of obtaining sufficient metal to meet their immediate needs. It is expected that the acute situation may be relieved by the first of the year, when production will have been considerably increased. An interesting sequel is looked for out of chaos that now prevails. Local dealers are maintaining last week's quotation of 32½ cents for lake and electro, and 31½ cents for castings, with the market very firm.

Tin.—The inability to secure permits has placed the market in a very strong but indefinite position. British co-operation must be given on a better basis to relieve the situation now developing. It is almost impossible to obtain prompt metal, and nothing definite is promised for first quarter metal. The New York quotation of 74 cents shows an advance over last week of 3 cents per lb. The local market has been influenced by American conditions and the shortage of stocks has resulted in dealers advancing prices to 70 cents per lb., 2½ cents higher than past week.

Spelter.—The market is still devoid of feature and continues quiet and unchanged, but relatively firm. The price recently fixed for galvanized sheets has not given much inducement for galvanizers to become actively interested, owing to the small margin of profit on the coating of black sheets. The demand is light but the undertone is one of early strength. New York's quotation of 8⅛ cents shows an advance of ⅜ cents per lb. The market here is not active but continues firm with prices strong at 10½ cents per lb.

Lead.—The situation has maintained its recent strength and quotations remain firm. This week's demand has not been so heavy but business is of a steady character. New York is a little firmer and local dealers report a strong but unchanged market with quotations firm at 7½ cents per lb.

Antimony.—The demand is irregular and a weaker market has resulted. The situation here is inactive but prices are well maintained, dealers quote 17 cents per lb.

Aluminum.—A slightly better tone has been evident during the past week but no features have developed. Quotations are steady at 60 cents per lb.

Machine Tools and Supplies

Renewed interest has been given to the machine tool industry by the placing of American contracts for 75 mm. and probably six inch shells in Canada. While this business will go to those plants that are well equipped with machinery for the purpose, it is very likely that much additional machinery will be required to meet the production of the new shells. Inquiries are already of an encouraging character, and dealers report increased activity in munitions orders and also general equipment. The near future may also see a renewal of activity in the production of British shells which has recently shown a falling off. Delivery on machinery coming from the States is very uncertain owing to the abnormal conditions existing there. Quotations on supplies have shown a tendency to steady under the price regulations on raw materials.

Scrap

Nothing of interest has transpired to alter the general tone of the old metal market and, while minor fluctuations have taken place during the week, the present quotations are the same as last week. Dealers here report a steady market with prices firm and unchanged.

Toronto

TORONTO, Ont., Nov. 20.—The revival in the munitions industry has already been reflected in the machine tool business, and the demand is more active now than it has been for some months. Further contracts for shrapnel have been placed by the Imperial Munitions Board, which, together with the 75 mm. shells, will keep a number of manufacturers actively engaged for some time to come. The 75 mm. contract is believed to be for seven million shells. A busy winter is anticipated in the shell industry. Mention was made in these columns some time ago of a plant being equipped for making airplane engines. This factory is now practically completed, and the manufacture of the "Sunbeam" motor will commence shortly. The firm in question is the Willys-Overland Co. of this city, and they have secured a contract for this engine, which will run into over $4,000,000. The Sunbeam is a "V" type motor with eight cylinders, and is rated at 200 h.p.

Steel

The latest development in the steel trade is an embargo which has been placed on the exportation of iron and steel from Canada. The exportation of certain forms of steel and iron has been prohibited except under license from the Customs Department. The products covered by the embargo include pig iron, steel ingots, billets, blooms, rods, bars, plates and shapes. Such action by the Dominion Government is not altogether a surprise in view of the serious shortage of steel and iron in the Dominion, which was intensified by the restrictions placed on the export of iron and steel a few weeks ago from the United States. The restriction of exports from Canada is largely a precautionary measure to conserve resources, and will not materially affect the export trade, as comparatively little tonnage in the above mentioned materials has been sent abroad. The export trade has consisted principally of a few steel products which are not included in the embargo. The fact that the exportation of steel has been prohibited proves emphatically that there is a shortage, and that there must be strict economy in the use of iron and steel. There is a report going the rounds that the embargo on steel from the States will be raised owing to the delay occasioned in obtaining shipping permits. In view of the heavy demand in the States for steel, this hardly seems likely, as the necessity of conserving supplies of steel for war purposes is paramount. The matter as it stands at present is as follows: The Priority Board will give precedence to requests for steel for munitions and other war supplies and for shipbuilding. It will then consider the needs of railways and their equipment and farming machinery.

There has been a further decline in No. 28 gauge black sheets, which are now quoted at $9 per 100 lbs., while prices of galvanized sheets are also lower, Premier No. 28 gauge being now quoted at $10.20 and 10¾ ozs. at $10.50 per 100 lbs. Weakness has developed in prices of steel plates, due to the easier market in the States following Government price regulation. Prices are down 1c per pound, and local quotations are now as follows: Plates, ¼ to ½ inch, $12; heads, $12.30, and tank plates, 3/16 inch, $12.10 per 100 lbs. A further decline in plates may be looked for in the near future. Apart from the above mentioned products, there have been no changes and prices are holding firm in the meantime. There is no indication of a decline in prices of bars or shapes just at present in spite of the easier situation in these products across the line.

Pig Iron

The embargo on the export of Canadian pig iron will not materially affect the market, as no pig iron is being exported. There is some "Hamilton" foundry iron now on the market at $50 per ton, which is the same price as "Victoria" iron. The market is a little firmer this week, due to the tight coke situation. In the States there is a scarcity of pig iron, and many steel companies are being forced into the market to purchase basic, Bessemer and low phosphorus pig iron because of the inadequate supply of coke, which has com-

pelled the banking and blowing out of their own blast furnaces. The coke situation is growing worse on account of the congestion of freight on the railways. There is practically no $6 furnace coke being offered on the market, so lower prices on this material are apparently unlikely for some time.

Scrap

There is no change in the situation in the scrap metal market, and prices are being quoted on the basis of quotations given last week. There seems to be a general disposition on the part of both buyers and sellers to await developments, as the market continues in an unsettled condition.

Machine Tools

The machine tool market is again active, and the outlook for business has improved considerably. More orders for shrapnel are being placed by the Imperial Munitions Board, which has resulted in inquiries for machine tools from plants which had disposed of some of their equipment. All indications point to great activity in the munitions industry this winter, as further orders for shells will likely be placed by the Munitions Board. One or two more firms have recently secured orders for 75 mm. shells from the United States Government, but further activity in this direction will likely be limited unless the present intentions of the United States Government undergo a change.

Supplies

Business in machine shop supplies is more active and prices are holding firm for most lines. Deliveries are no better, particularly on imported supplies, owing to the big demand in the States. Local supply houses seem pleased with the situation, the only complaint being in the matter of deliveries and shortage of some lines.

Metals

There is no change to speak of in the metal markets this week. A great scarcity of tin is reported from New York, although this does not appear to be the case locally, as some dealers report tin as being readily obtainable. There is nothing new to report as to copper, while the general position of other metals is also unchanged. The outlook in the market has improved owing to the revival in the munitions industry.

Copper.—The position of copper remains unchanged. Reports from the primary market indicate that larger consumers having contracts are well provided for, but others are not in such a favorable position. It is generally believed that there will be enough copper to go round, even after Government needs have been provided for. Lake and electrolytic copper are quoted at 32c and castings at 31c per pound.

Tin.—The price of tin continues high and the situation unchanged in the primary market. There is reason to believe that the shortage of tin in the States will become less acute in the near future, as an effort is being made by the authorities to relieve the situation. Tin is quoted locally at 72c per pound.

Spelter.—The spelter situation is more satisfactory and the demand is fairly good, although prices have not changed. Local price, 10½c per pound.

Lead.—There is still a fairly good demand for lead, which is holding the market firm. The undertone of the market is firm, with the possibility of higher prices. Local price, 8½c per pound.

Antimony.—The market remains weak owing to there being little demand, but a firmer market is looked for later. Antimony is quoted locally at 18c per pound.

Aluminum.—The market is firmer owing to a slight improvement in demand, but quotations are unchanged at 62c per pound.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the War Purchasing Commission appointed by the Canadian Government: Hormidas Laporte, Montreal, chairman; George F. Galt, Winnipeg; William P. Gundy, Toronto. Thomas Hillier is secretary, and the Commission headquarters are at Ottawa.

Washington

WASHINGTON, D.C., Nov. 19.—The United States Shipping Board has done away with the system of calling bids when placing its contracts for ship equipment and ship deck machinery. A survey of the market of available equipment is undertaken and purchases made in the open market where the best prices are quoted. This system has been adopted because it has been found that the calling of bids consumes too much time and delays the shipbuilding programme. Manufacturers who desire to compete for business should send their price schedules to F. H. Brown, purchasing agent, Emergency Fleet Corporation, Washington, D.C.

Vessels Under Construction

The Shipping Board now has under construction 1,200 ships, with a total tonnage of 7,500,000. There are 400 wooden and concrete ships building, with a total tonnage of 1,500,000 tons; 400 steel ships, with a tonnage of 3,000,000 tons; and 400 vessels taken over from private constructors with a total tonnage of 3,000,000. The Henry Ford automibile factory in Detroit has been turned over to the U. S. Government, and arrangements are now being made for the construction there of some of the equipment needed by the Emergency Fleet Corporation.

Changes in the Emergency Fleet Corporation have taken place with the entrance of Charles Piez, of Chicago, as vice-president. Admiral W. L. Capps, while still the general manager of the Fleet Corporation, has delegated the most of his power to Mr. Piez. From now on Admiral Capps will have supervision only over actual construction. Matters of policy and business will be controlled by Mr. Piez.

Requisitioning of Sailing Vessels

Possibility of the requisitioning of one million tons of sailing vessels now looms up. Thomas A. Edison, American inventor, has proposed a plan for the installation of engines in these craft, with twin screw propellers. Such vessels could be sent into the war zone, according to Edison. Naval constructors are now considering the practicability of the plan.

Navy Department Specifications

The Bureau of Supplies and Accounts of the Navy Department has asked for bids on the following articles:—Cocks, air; cocks, steam and water; cocks, stop; fittings, pipe bends; fittings, pipe unions; gauges for forced draft and forced lubrication; bronze automatic and non-automatic water gauges; pressure reducing valves; radiator and relief valves; brass steam and water valves. Manufacturers desiring to offer bids should write to the Bureau of Supplies and Accounts of the Navy Department, Washington, D.C., requesting schedules 1562, 1563, 1564, and 1565.

The War Trade Board has issued a new ruling prohibiting the exportation of tin plate from the United States except as containers for food products.

Curtailment of Motor Car Manufacture

Reports of the Department of Commerce show that exportation of motor cars to Canada during the month of September were as follows:— Sixty-two commercial cars valued at $90,445; 595 pleasure cars valued at $553,316. In view of this fact it appears that the War Industries Board proposed curtailment of the manufacture of pleasure cars in the United States will have a decided affect upon Canada. The present program for curtailment will reduce the manufacture of pleasure automobiles in the United States about sixty per cent. in the next six months.

Eight of the principal express companies in the United States have petitioned the Interstate Commerce Commission for a flat increase of ten per cent. upon express between the United States and Canada.

In order to facilitate the American merchant marine program the Railroads War Board has been concentrating flat cars for moving lumber to the shipyards. During the past week 1,500 flat cars have been rushed to lines operating between the lumber districts and the shipyards.

Director of Steel Supply Appointed

J. L. Replogle, vice-president of the American Vanadium Co., has been appointed director of the steel supply for the Council of National Defense. All demands for steel will pass through the hands of Replogle, working with the War Industries Board. It is the plan of the Council to name a number of such direc-

tories.

U. S. Firms Indifferent About Shells

[illegible] manufacturer; but two firms offered bids on a [illegible] will virtually cut off transportation facilities [illegible] organization of the Shipping Board in an advisory capacity.

New York

NEW YORK, Nov. 17.—The most encouraging development in the steel trade this week was the announcement that orders for commercial steel taken by the mills since Nov. 1 have been double the tonnage of the acceptances during the first half of October. This is an indication that the steel companies feel assured that so-called peace bookings will not interfere with the prompt execution of war orders for the United States and the Allied Governments.

Munitions Contracts Placed

The War Department has distributed orders for about 21,000,000 of the 33,000,000 shell referred to last week among various manufacturers in the United States and Canada. It is estimated that about one-third of such orders went to manufacturers in the latter country. It is estimated that about 150,000 tons of steel bars will be ordered by the Government to be shipped to munition makers. Nearly all of the above shell are for anti-aircraft guns and 75-mm. field pieces. Expenditures of between $225,000,000 and $250,000,000 on these contracts will be necessary.

It is understood that the T. H. Symington Co., the American Can Co., the American Car & Foundry Co., the New York Air Brake, the General Electric Co., and the Worthington Pump & Machinery Co. are among the companies to whom the principal shell awards were made. Some of these concerns have been actively buying machine tools for employment on Government work. Several other munition manufacturers have also placed contracts for machinery including the Osgood Mfg. Co. of Marion, Ohio., the International Fuse & Arms Corporation, of Bloomfield, N.J., and the Bartlett Hayward Co. of Baltimore. The latter company's purchases of tools has amounted to $300,000. The Twin City Forge & Foundry Co. of Stillwater, Minn., has a $3,000,000 contract for 6-inch shells.

Equipment for Gun Mechanisms

[illegible] $30,000,000 contract to manufacture re[illegible] [illegible] & Ordnance Co. has been [illegible] Wellman-Seaver-Morgan Co. of Cleveland, has been awarded two [illegible] has placed a contract for the building of a machine shop at its Akron, O., plant, where most of the steering engines will be manufactured.

The Navy Department has taken [illegible] installation at navy yards. The cranes to be purchased are the largest of this type that have ever been built and will cost approximately $2,000,000. The Government is also negotiating for a [illegible] of locomotive cranes to be put into service at railroad terminals along the Atlantic seaboard. The cost of these cranes will be about $18,000,000. Purchases of tools continue to be made for equipping the Watertown and Rock Island arsenals and buying of tools for the Watervliet arsenal is expected to begin this week.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Shipbuilding Contracts

The Emergency Fleet Corporation has placed a contract with the Federal Shipbuilding Co. for ten 9,400-ton merchant vessels, the building of which will require about 36,000 tons of shapes and plates. The American Bridge Co., which will do the fabrication for its sister subsidiary company, has already shipped the keel for the first boat to the plant in the Hackensack Meadows. The keel is being laid to-day and the keels for four other boats will be laid down at the same plant within the next two weeks.

The Dominion Bridge Co. of Montreal, Toronto, etc., has secured a second large order for the fabrication of the steel for some of the boats to be built at the Hog Island plant of the American International Shipbuilding Co. The Toronto and Montreal shops have capacity sold for ten months, indicating orders for 40,000 tons. Six shipbuilding companies on the Atlantic and on the Pacific coasts have placed additional large orders for machine tools this week.

Pittsburgh

PITTSBURGH, Pa., Nov. 17.—Details as to how much shell steel tonnage has been allotted against the Government's programme of placing 1,500,000 tons are not available, but it is thought that more than half the tonnage has been definitely placed. It is evident that in a short time the United States will be producing considerably more shell steel than ever before, as orders are being placed in Canada, and the United States is being canvassed to find additional plants that can be utilized for shell manufacture, while at the same time exports of shell steel are being continued at substantially the rate of 1916. September exports, just reported, show 148,932 gross tons of billets, blooms, ingots, etc., and 47,577 tons of steel bars, the bulk of the tonnage in each case being doubtless shell steel. The total iron and steel exports in September were 489,415 tons, exports for the nine months being 4,525,971 tons.

Export Prices

There has been some divergence of opinion as to what prices would rule in the case of iron and steel exported under the general principle known as "one price for all." That has customarily been stated as being one price for the Government, its Allies, and the public. Some held that this meant all sales, others contending "the public" meant only the public of the United States. There was a further question, also, as to sales to "The Allies," as that might mean the governments of the allied countries, or the countries themselves.

Gradually the situation has been clearing until now the common understanding is that the one price must apply to steel that is destined directly or indirectly for the war, while purely commercial steel, such as would be exported to South America, can be sold at any price. The real power in the matter is the bureau that grants export licenses. The understanding of those closest to the bureau is that Washington is going to be very strict in the direction that steel intended, even quite indirectly, for war use must go at not above the set prices.

Institute Announces Prices

The American Iron and Steel Institute has this week published a long statement pertaining to prices, extras, differentials, etc. This is in conformity with the arrangement between it and the War Industries Board, whereby the latter has set basis prices for various commodities and looks to the trade to develop prices in detail that will conform with the basis prices. The Institute committees work with the manufacturers in the various lines, but it does not follow that every price or regulation the Institute promulgates has the full sanction of the great majority

of the manufacturers involved. The Institute is under the necessity of eventually satisfying the War Industries Board that the prices and regulations are all in keeping.

Some of the prices announced by the Institute are:—Forging billets, base, $60 per gross ton; lapweld steel boiler tubes, basing discount, 34 per cent. off list; iron, 12½ per cent. off list, both on carload lots, 3½ to 4½-inch; rivets, 4.65c, base; iron bars, 3.50c, at mill; wire nails, $3.50 per keg.

It is prescribed for jobbers that they add to the mill price plus freight to warehouse a margin not greater than 1.00c for bars, shapes, plates and blue annealed sheets 16 gauge and under, and not more than 1.25c on black sheets, 18 gauge and lighter, and all galvanized sheets, while on shafting the margin is 25 points, equal to 1.25c on base sizes, the producers' discount being 17 per cent. off list.

Sheets Active

The sheet market has been rather active since the Government prices were announced November 5, 4.25c on blue annealed, 10 gauge; 5.00c on black sheets, 28 gauge; and 6.25c on galvanized, 28 gauge. Some of the mills had practically run out of orders, or at least enough to keep them fully engaged, while on the other hand consumers had been delaying purchases awaiting the Government prices. There has been a very fair tonnage done for the remainder of this year, with some deliveries running into January. Without formal opening of books, the American Sheet & Tin Plate Co. is now allotting first half tonnage in blue annealed and black sheets to regular customers, and first quarter tonnage in galvanized sheets. It does not appear, however, that sales are being made to jobbers at this time.

Tin plate for next year is also being booked, though this is hardly ordinary commercial activity, the distribution of the tin plate being so much under Government supervision. About 500,000 boxes are being allotted for export to Allied countries, all of this being tin plate calculated to help prosecute the war.

Generally speaking, the iron and steel markets are quiet, producers usually being well sold up and being indisposed to take on new business. Regular customers, it is constantly asserted, are being taken care of as well as possible.

Coke Supplies Inadequate

The Fuel Administration is paying more attention to the coke situation, but thus far without any material results developing. An order has been issued to ship furnace coke in preference to foundry, as the blast furnaces, insufficiently supplied for many months, are having a harder time than ever, but the tonnage of foundry coke is so small that its replacement by furnace coke cannot help a great deal, and of course foundries will have a still harder time. The chief trouble at present is with the railroads, which have furnished a poorer car supply the past week than for weeks past, the congestion at yards and sidings having grown worse.

More Ship Plates

In the past week or two the Illinois Steel Co. has put in operation the new 90-inch plate mill at the South Works, while the 160-inch plate mill at the Gary plant has just been put in operation. These two new plate mills follow the "Liberty Mill," 110-inch, built by the Carnegie Steel Co. at the Homestead works and put in operation last month. The three mills can produce, if it is possible to operate them at capacity, about 450,000 tons of ship plates a year, against not over 1,800,000 tons of plates of ship character produced in 1916. Some other plate capacity has been completed since the first of the year, and more is coming, and it is possible that in a few months the production of ship plates will be at a rate double the average rate of last year.

Sydney

SYDNEY, N.S., Nov. 16.—Matters affecting the labor and wages questions, and political and patriotic activities are monopolizing public attention in coal and steel circles in Cape Breton.

The Dominion Steel Co. announced an increase of ten per cent. to its employees effective November 1. This is the fifth wage increase given to the steel employees since January 1916, during which period the rate of common labor has increased from 14 cents per hour to 24 cents per hour. The increase given to common labor has been much greater than that given to the higher paid and more skilled workmen, because it is upon this class that the increase in the cost of living bears most heavily.

Coal Output Threatened

The Amalgamated Mine Workers of Nova Scotia met in convention in Sydney and passed a number of resolutions, some of which were of a rather extraordinary nature. A demand was made upon the Dominion Coal Co. and the provincial Government for the dismissal from their present official positions and cancellation of the certificates of the deputy inspector of mines for the Waterford District, and the superintendent and manager of Dominion No. 12 Colliery, because of their alleged responsibility for the explosion which took place at that mine in July last. Later, these officials were indicted by the Grand Jury for manslaughter in the same connection, and were committed for trial. This incident, so far as is known, is without precedent, and has aroused much feeling. The Waterford Local of the A. M. W. of Nova Scotia repudiated the action of the convention in its entirety, and similar action was taken by other locals. The leaders of the A. M. W. stated that if their demand was not complied with the mines of Nova Scotia would not work on two days in each week. This threat was however beyond the power of the leaders to enforce, as the workmen were out of sympathy with any attempt to stop work under war conditions, and the leaders have now announced that in view of the action of the Grand Jury they will not ask the men to take the extreme action advised by the resolution.

Coal Lease Boundaries and Production

The A. M. W. also demanded the rectification of the boundaries of the coal leases of the Dominion Coal Company and the Nova Scotia Steel & Coal Company, and asked the intervention of the Fuel Controller, making the unwarrantable assertion that if the Scotia Company were given access to certain areas of the Dominion Coal Company lying adjacent to the Scotia areas the production of coal could be increased one thousand tons per day. This is not the case, as altogether apart from the question of interfering with boundaries, the limitation on coal production in Cape Breton is entirely a question of labor supply. Both the Nova Scotia Steel & Coal Co. and the Dominion Coal Co. could increase their present outputs by 30 or 40 per cent. were men available, without any increase in mine territory.

Sickness Relief Fund Contributions

The A. M. W. have further demanded from the local Legislature that the Companies be compelled to contribute to the sickness relief funds at the collieries in the ratio of 80 per cent. from the Government and the Companies, and 20 per cent. from the employees. Up to the present time the men have maintained their own sickness relief funds, assisted to a moderate extent by the Government and the Companies.

In this respect the miners have been favored more than any other workmen in Nova Scotia, or for that matter in North America. In January, 1917, the Government passed a Workmen's Compensation Act which has trebled the cost to the coal companies of their previous contributions to sickness and workmen's compensation payments. Notwithstanding this tremendous increase on previous costs, the Dominion Coal Co. has offered to contribute 25 cents per month per man to the sickness funds, but in view of the intemperate attitude of the A. M. W. this offer has been withdrawn, and the Sickness Society has been compelled to cease its operations.

Wage Agreement Expiring

The wage agreement between the Dominion Coal Company and its workmen ceases at the end of 1917, and negotiations are now pending for its renewal. Much will depend on the attitude of the A. M. W., and it is to be hoped the demands which will be made by this organization will not be such that it is impossible for the companies to meet them. A similar condition exists in the case of the Nova Scotia Steel & Coal Co. collieries.

The A. M. W. is a new organization resulting from the amalgamation of the Provincial Workmen's Association and the U. M. W. of Nova Scotia, these two bodies representing respectively the moderates and radicals among the unionists. Latterly the radical element seems

to have [illegible] of the A. M. W., and the organization is largely on its trial before [illegible] which is not believed to indicate any interference with coal production at this juncture.

The A. M. W. is [illegible] two labor candidates for the forthcoming elections, who have adopted the political platform of the I. L. P. of Ontario, which among other things calls for nationalization of industries and alteration of the British North America Act.

N. S. Victory Loan Campaign

The Victory Loan Campaign has been attended with great success. The Dominion Steel Co. has somewhat under 5,000 employees and during five days these men have contributed $312,000.00 to the loan. It is expected that before the campaign closes an amount of $400,000.00 will have been subscribed by the Steel Co. employees. The Coal Co. campaign is not so far advanced, but the amount from that source should approach the Steel Co. total. An interesting contest is taking place between the two companies, and the patriotic spirit which is evident in this emulation goes far to assure the observer that the sentiments and the spirit of the coal and steel workers in Cape Breton are thoroughly sound, notwithstanding the effervescence of a small number of radicals who no more represent the men of Cape Breton than the Bolsheviki represent Russia.

EMBARGO IS PLACED ON IRON AND STEEL

EXPORTATION from Canada of iron and steel in unfinished or semi-finished forms, suitable for use in manufactures, will be prohibited by the Dominion Government, except under license from the Department of Customs. The classes of iron and steel goods upon the sale of which outside the Dominion an embargo is placed include pigs of iron, steel, ingots, billets, rods, shapes, angles and plates.

The prohibition of exportation is due to the serious shortage of iron and steel for munition making, shipbuilding and other manufactures. The United States Government has placed restrictions upon the exportation of iron and steel from that country, and has established a priority board to pass upon applications for export licenses. That board will give precedence to requests for steel for munition and other war supplies and for shipbuilding. It will then consider the needs of railways, railway car and locomotive building firms, and other industries.

Canadian manufacturers have conferred together with a view to laying their requirements before the United States priority board. It has been felt that at a time when Canada is applying to the United States for iron and steel it should itself take steps to conserve the domestic output of such material for domestic uses. Export licenses will be granted by the Customs Department only for very special reasons.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General Marseilles, British Consul General

INDIA—Calcutta, Director General of Commercial Intelligence

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address, Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross, 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—H. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

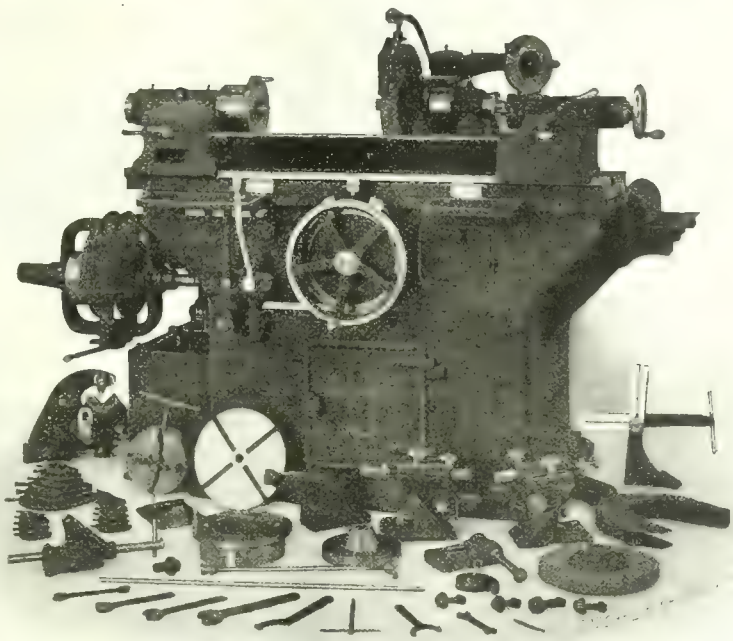
NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.

Landis Grinders *for* Production



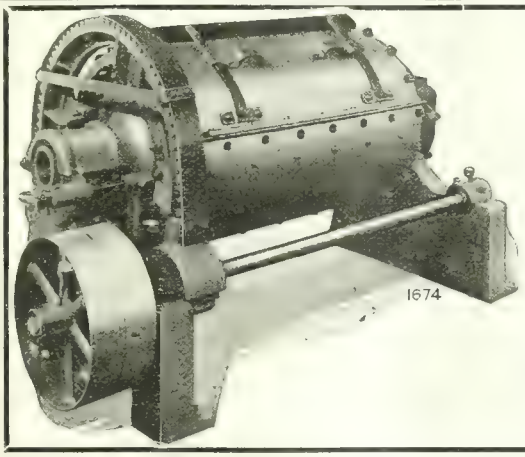
12" x 36" Plain, Self-contained.
Immediate.

12" x 52" Plain, Self-contained.
2 Weeks' Shipment.

No. 3 Universal 12" x 42".
January Shipment.

Write for Bulletin giving detailed description.

A. R. WILLIAMS MACHINERY CO., LIMITED WEST FRONT STREET TORONTO



Whiting Tumblers

Correct design and heavy construction enable Whiting Tumblers to last for years under the daily grind of the cleaning room.

All wearing parts quickly replaced at small expense. No studs used.

Write for New Catalog No. 132.

Complete Foundry Equipments

WHITING FOUNDRY EQUIPMENT CO. HARVEY-ILL. U. S. A. CHICAGO SUBURB.

Cranes of all Types

Scandinavia Belts

Can be used anywhere that leather can be used.

Scandinavia Belting is a solid woven cotton belt, made of long fibre cotton. It is impregnated to give further solidity, and the impregnation also acts as a moisture resistant. For direct drives where atmospheric conditions remain approximately the same, this belt is probably the best on the market to-day.

It stands up well on shifters.

W. P. BENNETT
51 Montfort Street, Montreal, P.Q.

Beltings *Packings* *Asbestos*

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Lindsay, Ont.—The G.T.R. will build and equip a machine shop here.

Toronto.—The Canada Tire & Rubber Co. propose building an extension to the power house.

Coleraine, Que.—The Boyer Mica Mining Co., Ltd., propose erecting a 60-ton mica mill here.

Toronto.—The Staff Association Co. have started rebuilding operations at the plant recently destroyed by fire.

Montreal.—The Dominion Bridge Co., proposes building a forging plant at Lachine for the production of marine forgings.

Toronto.—A permit has been issued to the John Inglis Co., 14 Strachan Ave., for the construction of a concrete tunnel in connection with the new power house.

Toronto.—Creber Bros. have been granted a building permit for a frame workshop for a stonecutter's plant at 204 Kingston Road, to cost $1,200.

Parkhill, Ont.—A by-law will be voted on by the ratepayers on November 26 to raise $12,000 to provide for the cost of a plant to distribute hydro-electric power.

Hamilton.—The Steel Co. of Canada has started construction of its by-product coke oven plant which will have a capacity of between 300,000 and 400,000 tons per year.

Renfrew, Ont.—It is understood that the International Molybdenum Co. will move their plant from Orillia to Renfrew when the Calabogi Light & Power Co. have their power plant in operation.

Toronto, Ont.—Damage estimated in the neighborhood of $10,000 was caused by fire of unknown origin which broke out at an early hour on Saturday morning in the St. Clair Foundry, on the Esplanade.

Toronto.—The Queen City Foundry Co. at Ashbridge's Bay, has been purchased by the Bond Foundry and Machine Co., of Manheim, Pa., and will be operated as the Bond Engineering Works, Ltd. It manufacturers grey iron castings.

Sarnia.—The Holmes Foundry, which recently purchased a large tract of land on Exmouth street, in the Village of Point Edward for the building of a large foundry to manufacture automobile goods and other foundry material, will not just at present erect the plant. The high cost and difficulty of getting steel is the reason for the delay in starting construction of the plant.

Montreal.—It is reported that the Dominion Bridge Co. have secured a large order from the American International Shipbuilding Corporation of New York for structural steel to be used for building cargo vessels for the United States Government. This together with a previous order amounts to 40,000 tons of steel plates and shapes which will be fabricated in the Montreal and Toronto plants.

GENERAL

Owen Sound.—The Union Cement Co., propose establishing a cement plant here.

Weston, Ont.—A new concern, The K & S Canadian Tires, Ltd., propose establishing a factory here for manufacturing drug supplies of rubber texture and later rubber tires. The town has offered a fixed assessment of $2,500 for five years.

MUNICIPAL

Delta, B.C.—Municipal Council contemplate the erection of a pump house and installation of electric pump costing $12,000.

Whitby, Ont.—A by-law will be submitted to the ratepayers on November 26 to authorize a loan of $26,000 to the United Rubber Manufacturing & Reclaiming Co., who propose establishing a factory here.

PERSONAL

Lieut. Hugh A. Kennedy, eldest son of Colin R. Kennedy, vice-president and manager of the A. R. Williams Machinery Co., of Vancouver, was killed in action in France on Nov. 16.

Major Gordon D. Powis, at one time representative of the Canadian Westinghouse Co., at Edmonton, has been killed in action. Major (then Captain) Powis went overseas in April, 1916, with the 63rd Battalion but was later transferred to another unit.

J. E. Dobson, late Scottish representative of Bruce Peebles & Co., Edinburgh, has been appointed London, (Eng.) office manager to the company in place of the late R. W. Gauntlett, and has now taken up his new duties at Hastings House, Norfolk Street, Strand.

C. Price-Green has been appointed Industrial Commissioner for the Canadian Northern System with headquarters at Toronto. The appointment is made in anticipation of the industrial reorganization and development which will follow the conclusion of peace in view of the great number of industrial opportunities on the lines of the Canadian Northern system. The aim of the department is to locate industries and to develop the natural resources along the company's lines.

TENDERS

Ottawa.—Assistant City Engineer Askwith has been given permission to call for tenders on the supply of an apparatus for thawing out city water pipes. The style of apparatus the engineer desires is gasoline driven and mounted on sleighs. The estimated cost is $3,500.

Armagh, Que.—Gouvin & Beauchemin, civil engineers, Quebec, are preparing plans and specifications for power development at Armagh, County Bellechasse, on River Fourche-du-Nord-Ouest, and will receive tenders for water turbines, dynamos, sluice-gates, penstock and wooden pipes, etc.

Port Arthur.—Tenders will be received until Monday, November 26, 1917, for the construction of a temporary pile protection breakwater at Port Arthur, District of Thunder Bay and Rainy River. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers, Equity Building, Toronto; Sault Ste. Marie, and Port Arthur.

Winnipeg.—Tenders will be received by the Commissioners of the Greater Winnipeg Water District up to Monday, Nov. 26, 1917, for the following:—Construction of tunnel, shafts and well at the Red River crossing; supply of cast iron gate valves, air valves and sluice gates, construction of gate house and intake at Waugh, Man. Specifications may be obtained on application at the office of the District, 501 Tribune Bldg., Winnipeg, R. D. Waugh, Chairman of Commissioners.

Winnipeg.—Tenders will be received up to Monday, Dec. 3, 1917, by the Commissioners of the Greater Winnipeg Water District for the following: Construction of a pressure pipe line from Red River to McPhillips Street Reservoir; manufacture and supply of 48-inch pre-moulded reinforced concrete pressure pipe; supply of cast iron pipe and specials. Specifications may be obtained on application at the office of the District, 501 Tribune Bldg., Winnipeg, R. D. Waugh, Chairman of Commissioners.

MARINE

Kingston, Ont.—The steamer Turbinia, which has been used in the passenger trade between Toronto and Hamilton for some time, was in port here recently, on her way to the coast, where she will be used for special work.

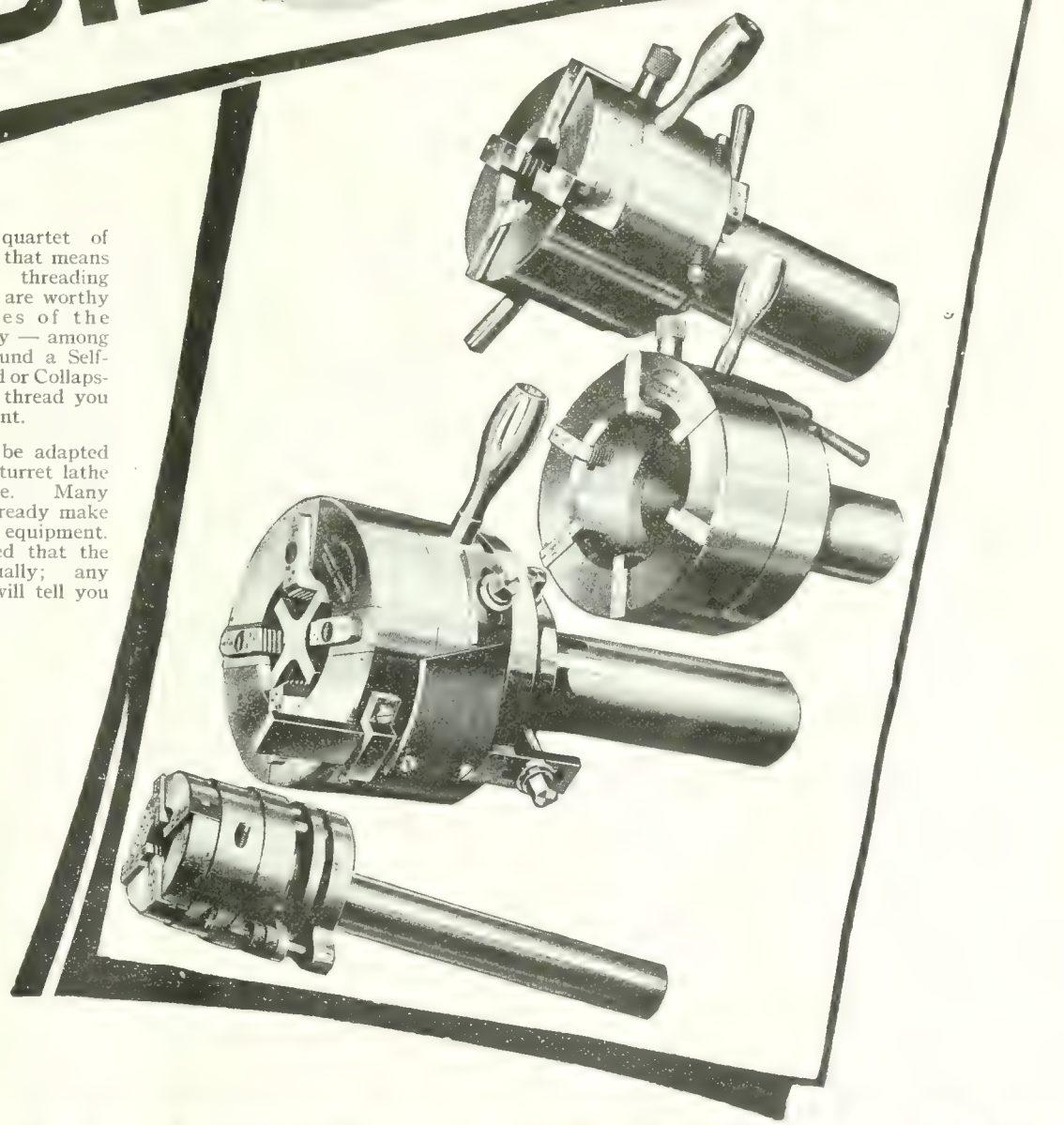
Toronto.—The Dominion Shipbuilding Co. has completed negotiations with the Harbor Commission, and will commence work almost immediately on a factory to be situated between Spadina avenue and Queen's Wharf, on a site comprising slightly over 15 acres. The agreement has been ratified by the Harbor Board. It is understood that shipbuilding will be carried on by the company on a large scale.

Mahone Bay, N.S.—McLean Brothers shipyard has been leased to Montague

GEOMETRIC DIE-HEADS

HERE'S a quartet of die heads that means death to threading trouble. They are worthy representatives of the Geometric family — among which can be found a Self-Opening Die Head or Collapsing Tap for any thread you could possibly want.

These tools can be adapted to any make of turret lathe or screw machine. Many manufacturers already make them standard equipment. We are convinced that the rest will, eventually; any Geometric user will tell you why.



THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

Mainly are the [illegible] now being extended so that three ships can be built at once. A new mill has been erected, and heavier machinery and air compressors for driving pneumatic tools have been added. The class of vessels to be built is the fast sailing West Indian, freighter type (the three will have three masts, will be auxiliary vessels and have gasoline engines for moving the anchors, sails and cargo. The first vessel is well under construction and the keel is now being laid for a larger ship.

TRADE GOSSIP

Ontario's Metal Ouput.—The Ontario Bureau of Mines reports that in the nine months ended September 30 last the province produced 11,064 tons of nickel, valued at $16,852,000, and 14,928 tons of copper, valued at $6,171,700.

Hamilton, Ont.—James Small, of the Hamilton Welding Co., will again take charge of the course in autogenous welding at the Technical School and L'Air Liquide Society will furnish the necessary equipment and gas for class work.

Patriotic Offer Accepted.—The Canadian Cartridge Co., of Hamilton, has made an offer to the British Government to manufacture munitions or any other war material at cost under Government supervision. The offer has been accepted.

Lake Navigation is Near Its Close.—A sign of the approach of the close of navigation on the Great Lakes and St. Lawrence route to the sea is the notice of the Marine Department that the buoys on the St. Lawrence will be removed on November 22. The lights will be kept burning, however, until December 4 or 5.

First Cement Boat Nearly Ready.—The launching of the first cement ship built in Montreal by the Montreal Drydock & Ship Repairing Co., which was to have taken place on November 14, has been delayed for a few days. The vessel is 126 feet long, has a draft of 11 feet, and a cargo capacity of 400 tons. She is intended for ocean trade.

British Inquiry for Marine Engines.—Further information may be obtained from the British Trade Commissioner in Canada, 363 Beaver Hall Square, Montreal, relative to the following inquiry: An English firm, builders of marine engines, etc., desires to get in touch with a Canadian representative who can sell their manufactures. (British Trade Inquiry Reference No. 1996.)

Terms of Embargo on Iron and Steel.—The terms of the order-in-Council prohibiting the exportation of iron and steel products from Canada to countries other than Great Britain and British possessions and protectorates have been made public. The prohibition extends to pig-iron, steel ingots, billets, blooms, bars and slabs; iron and steel plates; iron and steel shapes, comprising beams, channels, angles, tees and zees; iron and steel fabricated for structural work and shipbuilding.

New Storm Signal on Georgian Bay.—Notice is given by the Department of Marine and Fisheries of Canada that a storm signal station has been established 80 feet south-west of Cabot Head light house, west side of Georgian Bay. The bearings of the station are: Latitude north 45 degrees 14 minutes 45 seconds, longitude west 81 degrees 17 minutes and 25 seconds. Storm signals will be located on an arm projecting from a steel skeleton framework tower sixty feet high. The tower is square and has sloping sides. The signals are visible from all points of approach by water.

To Keep Chilean Nitrates for Allies.—A despatch from Valparaiso, Chile, states that a Parliamentary Commission has presented to Congress a draft law for the formation of the trust of nitrate producers. With Government intervention the law proposes to oblige the producers to enter the trust by doubling the nitrate export duties for outsiders. The measure is the result of a situation caused by the formation of the control of purchases for the allies. It is probable that the German producers will be able to continue to accumulate new stocks of nitrate, as they are able to obtain quantities of fuel oil from the petroleum companies contracting for fuel on this coast.

Lake Carriers' Association to Mobilize Tonnage.—The Lake Carriers' Association of Cleveland, Ohio, by a large majority have voted in favor of mobilizing the tonnage. That the plan will be adopted by practically all the members the officials of the association are quite certain, and an executive committee of five members will be elected to handle the fleet. The shippers and the independent owners will be represented on the committee, which will be composed of managers. Under the new plan the owners will direct the movement of their vessels very largely as heretofore, and the pooling, it is figured, will greatly improve despatch, and to a very large extent do away with the bunching of freighters at the loading and unloading ports.

Scientific Council Oppose Export of Power.—The Dominion Advisory Council for Scientific and Industrial Research has passed a resolution, which has been forwarded to the Minister of Public Works, expressing disapproval of the proposal to construct a dam at the foot of the Coteau Rapids, on the St. Lawrence River. The resolution declares that "when power is exported to a foreign country, vested interests, if not vested rights, are thereby threatened, which makes it extremely difficult to recover, at a later date, the power then exported, without the danger of creating a grave international situation." It is also recommended "that regulations be enacted under which no further Canadian hydro-electric power be exported, but that this be retained as a national asset for the development of industries in the Dominion."

CONTRACTS

Toronto.—The Board of Control has adopted the report of the Fire Chief in awarding contracts for this year's supply of fire hose. Gutta Percha & Rubber Co., 1,750 feet; Goodyear Tire & Rubber Co., 1,000 feet; Dunlop Rubber & Tire Co., 1,750 feet, and Canadian Consolidated Rubber Co., 500 feet. The price was $1.15 per foot with the exception of the Goodyear hose which was $1.05 per foot.

INCORPORATIONS

The Dominion Shipbuilding Co. has been incorporated at Toronto with a capital of $1,000,000 to carry on the business of shipbuilders at Toronto. The provisional directors are J. Max Bullen, Harold L. Steele and James H. Fraser, all of Toronto.

The Union Box & Shook Mills has been incorporated at Ottawa with a capital of $150,000 to manufacture boxes, shooks and articles made of wood at Pembroke, Ont. The incorporators are John H. Reeves, James R. Lockhart and William F. Behan, all of Pembroke.

La Campagnie d'Engine-Turbine Revolution has been incorporated at Ottawa, with a capital of $100,000 to manufacture engines, aeroplanes, motor vehicles etc., at Montreal. The incorporators are C. J. E. Charbonneau, D. Pelletier and J. P. Lamarche, all of Montreal.

The Great West Chemical Co. has been incorporated at Toronto with a capital of $1,500,000 to acquire and develop mineral deposits, smelt and refine minerals of all kinds. The head office is at Port Arthur, Ont., and provisional directors are R. J. Allman, A. Plenty and S. A. Wilson, all of Toronto.

The Harrington Pick & Tool Co. has been incorporated at Ottawa, with a capital of $50,000 to manufacture tools, implements and machinery of all kinds. The head office is at Toronto and the incorporators are Frank S. Harrington of New York City, also J. M. Blackhall and W. P. Crow of Toronto.

The Woodstock Cotton Spinning Co. has been incorporated at Ottawa with a capital of $50,000 to carry on the business of spinners of cotton yarns and manufacturers of cotton goods at Woodstock, Ont. The incorporators are Edwin Holden of Woodstock, and Andrew McGladrey and Archibald Holm of Guelph.

CATALOGUES

Machine Tools.—The Canadian Fairbanks-Morse Co. have issued a stock list of machinery for November.

Bennis Stookers.—Edward Bennis & Co., Little Hulton, Bolton, England, have issued a catalogue containing a few concise descriptions of "Bennis" stookers and furnaces installed in boiler houses of leading firms. The catalogue contains views of these installations as applied to various types of boiler, accompanied by a brief description of each.

Saws Sammy Showme Saw is the title of a new monthly publication issued by the Simonds Mfg. Co., Fitchburg, Mass. In a series of twelve reels, the investigations of "Sammy Showme," at various plants where Simonds' saws are in operation, are related together with illus-

trations showing the product and pictorial reference to "Sammy."

The Cleveland Milling Machine Co., Cleveland, O., have issued a 35 page booklet called "Stock List of Cutters," published on the fifteenth of each mouth. This is a handy little booklet and contains a list of standard cutters which are in stock and from which immediate shipment can be made. Copies of the booklet may be had for the asking.

"Labor Saving Devices" is the title of a catalogue issued by the Manufacturers Equipment Co., Chicago, Ill. The devices in question comprise an interesting line of special tools, including air operated chucks and collapsible taps designed for various classes of work where quick action is desirable. The various styles of M. E. C. aero chucks, air cylinders, collapsible taps, etc., are fully described, accompanied by exterior and sectional views showing the details of construction. Other devices described and illustrated include the M. E. C. air valves, air vises, overshot box tools blow valves, etc. This catalogue contains fifty pages and is gotten up in an attractive manner.

BOOK REVIEWS

Effects of Storage Upon the Properties of Coal.—A series of experiments, started in 1910, to determine the effects of storage upon the properties of bituminous coal has recently been completed by the Engineering Experiment Station of the University of Illinois. The object has been to devise methods of storing which will avoid the risk of spontaneous combustion and to determine the extent to which coal deteriorates in storage. Professor S. W. Parr, under whose direction the tests have been conducted, summarizes the results in Bulletin No. 97 of the Engineering Experiment Station. It is shown that, if properly sized and carefully handled, coal may be stored without danger of spontaneous combustion; that the actual loss of heat value, or deterioration, resulting from storage is slight; and that underwater storage eliminates entirely all risk of spontaneous combustion or of deterioration. The extent of the waste and economic loss incident to the present method of seasonal production, with its attendant abnormal demands upon transportation facilties is discussed, and it is estimated that the lack of storage facilities in large distributing centers necessitate a capital investment in mines and railroad cars of $500,000,000 in excess of the amount which would be required if production could be maintained at a uniform rate throughout the year. Copies of Bulletin 97 may be had without charge by addressing C. R. Richards, Director of the Engineering Experiment Station, University of Illinois, Urbana, Ill.

TRADE INQUIRIES

THE following inquiries have been received by the Department of Trade and Commerce, Ottawa, from which further particulars may be obtained:

1146. **Pumps.**—A commission agent in

METAL STAMPINGS

We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

We can finish steel stamping in Nickel, Brass or Copper.

Send us a sample order.

W. H. BANFIELD & SONS
372 Pape Avenue, Toronto, Can.

MORTON MANUFACTURING CO
PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R R SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS
OFFICE AND WORKS: MUSKEGON HEIGHTS U.S.A.

BUY
"Victory"
Bonds

"Shall we be more tender with our dollars than with the lives of our sons?"

This space donated to Victory Loan Committee by Messrs. MacKinnon, Holmes & Co.

"HAWK" D CHROME VANADIUM STEEL

Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use.

It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

Hawkridge Brothers Company
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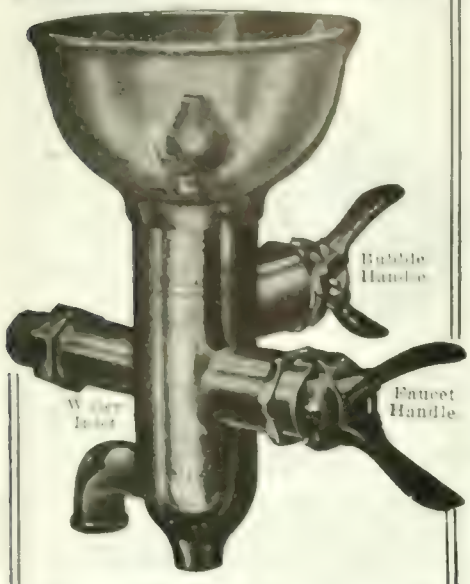
THE IRON WORKS LIMITED
Successors to
Owen Sound Iron Works
Owen Sound, Ont.
Engineers
Boiler-makers
Founders
Machinists
Tank Work
Smoke Stacks,
Grey Iron and Brass Castings,
Special Machinery Made to Order

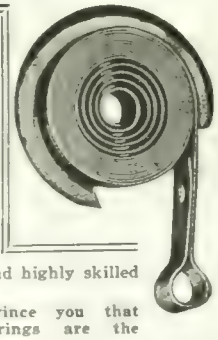
PURO
MADE IN CANADA
Saves Dollars



Puro Pays for Itself

"PURO - FY"
YOUR WATER SUPPLY
Puro Sanitary Drinking Fountain Company
147 University Ave., Toronto, Canada

'Barnes-Made'
Springs
are unusual in service and wear.
They are the result of sixty years' experience, unsurpassed equipment and highly skilled workmanship.
A trial will convince you that "Barnes-Made" Springs are the best buy.



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THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U. S. A.
Manfrs of "Barnes-made" Products
Springs Screw Machine Products Cold Rolled Steel and Wire

1448. **Flour mill machinery.**—A party [illegible] Omsk, Siberia, would be glad to receive quotations from Canadian manufacturers in a position to supply roller flour milling machinery of a size 14 feet diameter and 37 feet in length.

1449. **Fibre board.**—A London manufacturing company wishes to get into touch with Canadian manufacturers of fibre board with a view to business after the war.

1451. **Machinery.**—A Cape Town firm of manufacturers asks for catalogues and price lists of starch making machinery, tartaric acid machinery, and grain alcohol machinery.

1452. **Agencies.**—A Johannesburg engineer, with established selling connections on the Rand, is prepared to take up the representation for Canadian manufacturers of mining machinery, mining material and supplies of all kinds.

1453. **Agencies.**—A firm in Johannesburg with established connections is prepared to handle general engineering articles and supplies, including refrigerating machinery of all kinds.

1455. **Mining supplies.**—A firm of South African manufacturers, who are members of the Johannesburg Commercial Exchange, request correspondence from Canadian manufacturers of lubricating oils, belting, drill steel, paints, picks, shovels, rubber conveyor belting and rubber goods in general.

1456. **Carbon.**—A firm of engineers in Johannesburg are prepared to take up the agency for Canadian-made carbon, brushes, dry cells, arc lamps, carbons, bioscope and projector carbon. Other details on file at Department of Trade and Commerce, Ottawa.

MACHINERY PARTS FOR BRAZIL

THERE is felt, in practically all departments of the machinery trade of Brazil, the want of certain equipment, such as shafting, pulleys, gearing, hangers, couplings and bearings. The demand is not only insistent among factories and railway workshops, but the Government departments are as short of supplies as any other class of consumer. The current demand is but indifferently supplied from the United States, the factories of North America being principally engaged upon work for the Allies. In normal times Brazil is a fine market—perhaps one of the finest in the whole of Latin America—for machinery supplies, tools, etc., all the principal dealers carrying permanently large stocks which are continually in need of replenishment. The many gas, electric light, water, and other corporations carrying out their own repairs and construction, the several railway shops, both Government and privately owned, the retail establishments, etc., are always in the market for supplies. Some idea of the extent of the requirements in the direction of small machinery and tools may be gathered when it is known that Brazil to-day maintains no fewer than 2,292 manufacturing establishments of some importance, for the industries of this character have always received support and encouragement from the Federal and State Governments. The most numerous industrial plants are to be found, of a necessity, in the Federal district (containing the capital), where there are some 584 factories, employing 30,490 hands and having an annual production worth between £12,000,000 and £13,000,000. The State of Minas Geraes comes next with 551 establishments, employing, however, only 8,850 men; the State of Sao Paulo, although possessing but 323 establishments, finding employment for 23,007. It is in this city that are found the most successful railway and railway shops in the country, those of the Sao Paulo Railway Company, a British-owned enterprise. Other States where large numbers of factories are to be met with are Rio Grande do Sul, employing 10,490 hands, and having an annual output worth £3,000,000; Santa Catharina, employing 1,600 hands in 125 different factories; and Rio de Janeiro, with 190 factories and employing 11,700 men. Taking the whole of the industrial establishments, together numbering, as above mentioned, nearly 2,300 different factories, there are engaged upon manufacturing work 123.950 employees, representing a capital of £32,563,540 sterling, and producing to the value of £37,326,600 annually. The worth of this market to manufacturers of machinery and supplies of all kinds need not be emphasized. It is only necessary to add that, large and attractive as it is, every day sees it become wider and more insistent on receiving supplies from Europe.—*The Times Trade Supplement.*

STEEL FREIGHTERS FOR THE BRITISH GOVERNMENT

THE steel cargo steamers which the Canadian Allis-Chalmers will build for the British Government at Bridgeburg will have a capacity of 3,500 tons each. They will be 261 feet long over-all, 43 ft. 6 in. breadth moulded and 23-foot depth moulded, of steel construction throughout, and are to class 100 A1 with British Lloyd's Register of Shipping. They will be of the usual bulk-cargo type, but with special features adapting them for use during the present war-time conditions, being provided with appliances to protect the vessels against submarine attacks, in addition to being arranged with a view to evade visibility and identification. The steel entering into the construction of these steamers will be furnished by the British Government through the Cunard Steamship Co., and it is understood that a considerable tonnage of this steel will be available for delivery this year, enabling the builders to start operations immediately.

The propelling machinery will be constructed at the Davenport Works, Toronto. The main engine will be of the triple expansion type, the size being 20

in., 33 in., and 54 in. by 40-in. stroke and of the surface condensing type. The boilers will be two in number, 14 feet diameter and 12 feet long, constructed for a working pressure of 180 pounds. They will be fitted, for economical working, with the Howden forced draught system.

The coal bunkers will be located under the bridge deck and in the wings of the boiler space and will hold over five hundred tons.

The cargo holds will be three in number: Nos. 1 and 2 holds to have one cargo hatch each and the No. 3 hold abaft the engine room being provided with two cargo hatches. Each cargo hatch will be served by two independent cargo derrick booms, each of five tons capacity, and each boom with its independent cargo winch. The steam steering engine will be located on the upper deck in a special house abaft of the engine casing. The life-saving equipment will include two 26-foot lifeboats and one 18-foot working boat. The water ballast tanks, 3 feet deep amidships, will extend the entire length from the collision bulkhead forward to the peak tank aft. The accommodations throughout the ship will be steam-heated and the lighting throughout will be by electricity.

BRITAIN IMPORTS MORE CANADIAN ASBESTOS

THE publication of the annual statement of the trade of the United Kingdom for 1916 shows a remarkable increase in imports of Canadian asbestos. During the three years 1914-15-16 remarkable increases are reported in the quantities and values of Canadian raw asbestos imports into Great Britain. In 1912 the imports were 74,043 cwts., valued at $200,750; in 1916 they advanced to 244,932 cwts., valued at $922,590. The high-water mark appears to have been reached in 1915, however, with a total quantity of 349,863 cwts., valued at $1,048,500. The total imports of the United Kingdom from all sources in 1916 were the highest on record, 534,237 cwts., valued at $2,687,000. The main source of supply continues to be Canada, although supplies have considerably increased from the United States, Portuguese East Africa, and the Cape of Good Hope.

EXPORT OF CANADIAN COPPER TO BRITAIN INCREASES

A LARGE increase in imports of Canadian copper and zinc into Great Britain is shown in the annual statement of the trade of the United Kingdom for 1916. Exports of copper regulus and precipitate from Canada to Great Britain rose from 800 tons in 1912 to 6,071 tons last year. The respective values were $120,000 and $919,000. Exports of crude zinc, in cakes, from Canada, advanced during the comparative period from 997 tons, valued at $98,500 to 1,236 tons, valued at $539,100.

PATENT ATTORNEYS

RESEARCH BUREAU
REPORTS BY EXPERTS ON SCIENTIFIC, TECHNICAL AND INDUSTRIAL DEVELOPMENT.
SPECIAL RESEARCHES ARRANGED.
PATENTS, TRADE MARKS, ETC
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Pamphlet sent free on application.
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TORONTO, CANADA

PATENTS
Fetherstonhaugh & Co.,
The old established firm. Patents everywhere. Head office, Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada.
Booklet Free.

OVENS
Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
Write for Booklet.
Brantford Oven & Rack Co., Ltd.
Brantford, Canada.

Lanco Balata Belting
TRADE MARK
LANCO BALATA
BELTING
FOR BIG SERVICE
Lanco Balata is as nearly stretchless as it is possible to have a good belt and is really waterproof.
Have you our Belting Book? Sent free on request.
Federal Engineering Co., Limited
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Engineers
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PAPER MILL MACHINERY
and
MACHINE TOOLS for IRON WORKERS
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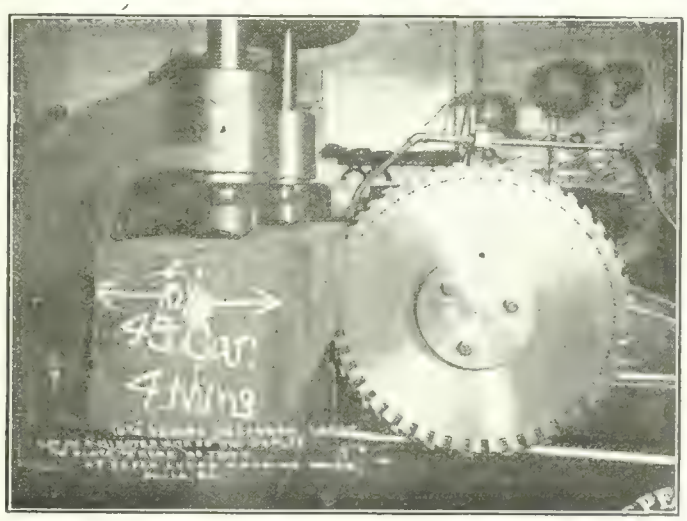


Circular Metal Cutting Saw Blades for Any Type of Machine

Let us demonstrate what a saving can be made by installing a
HUNTER "DUPLEX" Inserted Tooth Blade
Write for information
HUNTER SAW & MACHINE CO., Pittsburgh, Pa., U.S.A.

CLASSIFIED ADVERTISING SECTION

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

FOR SALE

SIX [illegible] FOR SALE. VERY [illegible] The National Equipment [illegible] Peter st. [illegible] c21m

BOILER FOR SALE (ONE HUNT SAFETY [illegible] Brantford, Ont., Canada, 150 H.P., [illegible] Steam [illegible] Address The Farmers' Bank, [illegible] and St. Andrews st., Montreal) c18m

FOR IMMEDIATE SALE 1-20 N. 1 AND 10 [illegible] Saw Benches, in excellent condition. The Peck Rolling Mills, Limited, Montreal. c19m

AGENCIES WANTED

ENGINEER AND BUSINESS MAN WITH office in Manchester, England, is prepared to [illegible] for a good [illegible] representative in England. Would attend to the interests of a firm shipping munitions. Box 337, Canadian Machinery. c19m

AGENCIES WANTED—FRENCH ENGINEER [illegible] established clientele, desires direct agency for France of labor-saving machinery of all kinds for wood and iron working, as well as factory equipment. Headquarters in hearts of Paris, near the Opera. Write E. A. B., Room 444, 14 Phillips Sqr., Montreal.

AGENTS WANTED

WANTED — LIVE REPRESENTATIVE TO handle good specialty; one who hasn't too many lines in the [illegible]. Apply Box [illegible], Canadian Machinery, stating lines you now represent and the [illegible] you are prepared to cover. c23m

CANADIAN AGENTS WANTED FOR GOOD chuck, especially adapted for use in munition plants. Box 349, Canadian Machinery. c23m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

MANUFACTURERS' OPPORTUNITY

A [illegible] American Concern desires to [illegible] with a reliable Canadian Manufacturer for the production [illegible] of a small Marine Motor, for the Canadian and Export Trade. A modern equipment, with knowledge of economical production of interchangeable machinery and parts, and good shipping [illegible] essential. The [illegible] favorable, if not continuous, contract is offered. Address Box 353, Canadian [illegible] c23m

SITUATIONS VACANT

WANTED — SUPERINTENDENT FOREMAN, [illegible] British shops. Box 340 Canadian Machinery c19m

WANTED — MECHANICAL DRAUGHTSMAN [illegible] for [illegible] compressor and general work. State experience and salary expected. Apply The Lachine Machine Company, Limited, Sherbrooke, Que. c16m

WANTED MACHINE SHOP FOREMAN FOR small shop doing general work, not munitions, near Toronto. State experience and salary expected. Give references. Box 345, Canadian Machinery c20m

MARINE ENGINE ERECTOR WANTED FOR Canadian shop an experienced foreman to take charge of erecting 1400 H.P. marine engines. Apply Box 347, Canadian Machinery c21m

WANTED

WANTED — SECOND-HAND CUPOLA AND other foundry equipment. State full particulars and price. Box 346, Canadian Machinery. c21m

WANTED—ONE No. 166 BLISS 2-SPINDLE automatic trimmer and beader, also 1 No. 156 single spindle trimmer, or machines of similar design. Must be in good condition. In replying state fully the name of maker of machines and lowest price, also where they could be seen. Box 342, Canadian Machinery. c18m

WANTED—ONE HORIZONTAL RE-DRAWING or reducing press, fitted with bottom knockout, the general dimensions of which should be equal to Bliss No. 62. Must have flywheel not less than 725 lbs. weight and approximately 3 ft. 6 in. in diameter. Press must be in good working order. In replying, give all dimensions, also state name of maker and lowest price. Box 341, Canadian Machinery. c18m

WANTED TO PURCHASE TWO SECOND-hand lathes, 24" swing, 8' to 12' bed. Submit offers with cuts and full description to E. Langham, General Purchasing Agent, Canadian Northern Railway Company, Toronto. c19m

WANTED—VERTICAL MILLING MACHINE with table not less than 26" x 10", minimum distance centre of spindle to face of column 14". Reply, giving full particulars, price and where machine can be inspected. Box 352, Canadian Machinery. c21m

SECOND-HAND RADIAL DRILL WANTED—in good condition, 1 ft. to 6 ft. swing. Give full particulars. The Volta Manufacturing Co., Welland, Ont. c21m

SITUATIONS WANTED

MECHANICAL AND CONSTRUCTION ENgineer desires change, twenty years' general experience; specialty steam power plants; knowledge pulverized coal. Box 343, Canadian Machinery c21m

GRADUATE MALE NURSE, AGE 32, HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

GENERAL SUPERINTENDENT DESIRES position years of machine shop and toolroom experience, efficient production methods, as well as extensive experience with various sizes of shells. Box 350, Canadian Machinery. c22m

PRACTICAL WORKS MANAGER AND MEchanical expert with years of experience in Scotland and Canada, a specialist in marine engines and winches, open for engagement; best of references. Apply Box 351, Canadian Machinery. c23m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

FOR SALE

2 - 16" x 5' Reed Lathes, elevating rest.
1 16" x 6' Reed Engine Lathe, plain rest.
1—16" x 6' Reed Engine Lathe, R. and F.
1 18" x 8' Davis Engine Lathe, D.B.G.
1 18" x 8' Porter Engine Lathe.
1 22" x 10' Nicholson & Waterman Engine Lathe.
1 No. 3 Brown & Sharpe Automatic Gear Cutter.
1—30" old-style Brainerd Automatic Gear Cutter.
1 5" x 48" Pratt & Whitney Plain Grinder.
1—No. 3 Lees-Bradner Thread Miller.
1 15" Jungst Shaper.
2 24" x 24" x 6' Powell Standard Planers.
2 30" x 30" x 8' Powell Standard Planers.

Brownell Machinery Co.
Providence, R. I.

"Williams" Condensed List Machine Tools

NEW LATHES.

1 16" x 6' CISCO Q.C.G., Comp. rest
1—16" x 8' CISCO S.B.G., quick change
1 18" x 8' SOUTH BEND
5 18" x 10' CISCO D.B.G., quick change.
5 19" x 16' LeBLOND D.B.G., Q.C.
2 21" x 8' LeBLOND D.B.G., Q.C.
1 25" x 16' LeBLOND D.B.G., Q.C.

USED LATHES.

1 14" x 6' LeBLOND tool room equipment
1 16" x 6' CINCINNATI D.B.G., Q.C.G.
2—20" x 10' LODGE & SHIPLEY geared head.
1 27" x 16' REED PRENTICE geared head.

PLANERS

1 36" x 36" x 11' INDUSTRIAL ENG. WKS., one head.
1 38" x 38" x 8' LONDON one head, fine condition.
1—52" x 52" x 16' McKECHNIE BERTRAM one head.
1—62" x 62" x 20' CANADA TOOL WORKS two heads.
1 36" x 36" x 12' McDOUGALL three heads.

SHAPERS

2 New 24" GOULD & EBERHARDT shapers.
1 New 28" GOULD & EBERHARDT "INVINCIBLE" type shaper.
1 14" SMITH & MILLS single geared.
3 16" SMITH & MILLS back geared.
2—20" SMITH & MILLS back geared.
1 16" KELLY back geared.
3 20" KELLEY back geared.
2 24" KELLEY back geared.

SLOTTERS AND KEYSEATERS

1 29" SELLERS.
1 9" BERTRAM.
1 18" MORTON keyseater.
1 No. 2 DAVIS keyseater.

RADIAL DRILLS.

1 6' BERTRAM heavy duty speed box.
1—5' REED PRENTICE heavy duty speed box.
1 5' DRESES MUELLER round column gear type.
1 2½' FOSDICK round column speed box.

UPRIGHT DRILLS

15" LINGREN, 14" CHAMPION, 20" SILVER
20" BARNES B.G., 22½" BARNES B.G.
26" BARNES sliding head, 28" BARNES sliding head, 30" SIBLEY sliding head.
DI COLBURN No. 340 BAKER heavy duty.

BORING MILLS

10' NILES two swivel heads, takes 64" under the cross rail width of rail 19" tool bar 4" round by 25", travel power friction feeds drive six-step cone for 4" belt, in absolutely first class condition.
BERTRAM HORIZONTAL BORING MACHINE, cone type head stock, four-step cone for 4" belt, spindle 4", diameter 8", steel slotted adjustable table 48" wide by 96" long.

MILLERS

Nos. 2H and 3H LeBLOND Universal
No. 2 FORD SMITH plain and universal
No. 2 CINCINNATI, No. 2 MILWAUKEE Universal.

PUNCHES AND SHEARS

No. 4 C.M.C. single end, 18" throat.
No. 3 BERTRAM single end, 5" throat.
No. 3 BERTRAM single end shearing machine, 8" depth of throat.
BERTRAM Horizontal Punch, 10" depth of throat.
No. 5 C.M.C. double end, 18" throat.
ROCKRIVER single end, 48" throat, 1¼" hole.
ROCKDRIVER single end, 36" throat, 1¼" hole.
BERGUE auto multiple punch, 56" long by 6' 6" wide, fitted with 18 punches to punch ⅞" diameter holes through ⅝" plate, including eighteen ⅞" punches and one set of twenty-seven ⅝" punches.

The A. R. Williams Machinery Co., Limited
64 FRONT STREET WEST TORONTO, ONTARIO

MACHINERY FOR SALE

List of Machinery at Empire Tobacco Company, Granby; Prices are for Apparatus on Skids in Company's Yard.

	Machine	Maker	H.P.	Press	Size	Grate	Remarks	Price
H.R.	Tubular Boiler	W. C. White, Montreal	80	100	5'0"x14'0"	5'0"x5'0"	Installed 1900 single lap joints	$400.00
"	"	Jenckes Machine Co., Sherbrooke, Que.	125	100	6'0"x16'0"	6'0"x6'0"	Installed 1905	800.00
"	"	Jenckes Machine Co., Sherbrooke, Que.	125	100	5'6"x16'0"	5'6"x5'6"	Installed 1905	800.00

These boilers are without grates, but have fronts, gauges and cocks.

	Machine	Maker	H.P.	R.P.M.	Size	Pulley	Remarks	Price
(1)	Fan	Sheldon & Sheldon, Galt	8	480	48"			$ 34.00
(1)	Horizontal Corliss Valve Engine	Laurie Engine Co., Montreal	85	72	12"x36"	108"x16"	Installed 1905	600.00
(1)	Horizontal Slide Valve Engine	Robb Engineering Co.	12	200	6"x10"		Installed 1905	140.00
(1)	Horizontal Wheelock and Engine	Goldie & McCulloch	55	95	10"x30"	90"x16"	Installed 1896	500.00

	Machine	Maker	Press	Size	Remarks	Price
(2)	Vertical Belt-driven Triplex Hydraulic Pump	John H. McGowan, Cincinnati	6,000-lb.	1"x5⅝"x6"	Installed 1900	$225.00
(1)	Horizon. Belt-driven Duplex Hydraulic Pump	Pontbriand & Freres, Ltd., Sorel	6000 lb.	¾x1½x2½	Installed 1907	75.00
(1)	Vertical Belt-driven Duplex Hydraulic Pump	Laidlaw, Dunn & Co., Cincinnati	3000 lb.	1¼x3½x4"	Installed 1895	140.00
	Vertical Triplex Hydraulic Pump	J. T. McGowan, Bliss.		1"x5½x7"	Installed 1896	250.00
(1)	Fan—Height, 110"; base, 3'8½"x6'9½"; inlet, 3'0"-11"; outlet, 3'6"x3'0"; pulley, 22"x9½"; shaft, 2 9/16"; runner, 5' 6"				Sturtevant	350.00

APPLY

IMPERIAL TOBACCO CO. OF CANADA, LTD.
900 St. Antoine St., MONTREAL

A MAN was wanted as Tool-room Foreman. He was found by a condensed ad. in

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Ave., Toronto

PETRIE'S LIST of New and Used Machine Tools

In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

16" x 5½" MacGregor, D.B.G. (2).
16" x 6' Pratt & Whitney, B.G.
18" x 10' Libby (2).
20" x 7' Fay & Scott.
22" x 8' Pratt & Whitney, B.G.
22" x 8' Martin, single purpose (2).
24" x 8' Lodge & Shipley.
26" x 8' Fay & Scott, B.G.
2" x 24" Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

6" x 30" Dalton, B.G., bench.
13" x 6' Filsmith, D.B.G., comp. rest.
14" x 6' Lodge & Shipley, taper attachment.
15" x 6' Sebastian, B.G., comp. rest (3).
16" x 8' McDougall, B.G., comp. rest (2).
16" x 8' Porter, B.G., comp. rest.
18" x 8' C.M.C., D.B.G., comp. rest.
18" x 10' Putnam, back geared.
18" x 6' Barker, B.G., comp. rest.
20" x 8' Fifield, B.G., plain rest.
22" x 8' Pond, B.G., plain rest.
24" x 11' Pond, B.G., comp. rest.
26" x 14' Gleason, D.B.G.
30" x 10' Ames, B.G., plain rest.
31" x 16' Fifield, back geared.

DRILLS

14" Excelsior, sliding head, lever feed (6).
15" Avey, high-speed, ball-bearing.
16" Barr, sliding head, lever feed.
20" Silver, back geared, power feed (2).
20" Barnes, 3-spindle, lever feed.
24" Kerkhoff, back geared, power feed.
26" Prentice, back geared, power feed.
32" Cincinnati, heavy duty.
40" Bickford, back geared.
46" Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

10" x 30" Landis, universal.
No. 1 Cincinnati, universal (2).
No. 1 Barkey, pedestal.
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer.
24" Barnes, wet tool.
2¼" Yankee, twist drill.

IRON PLANERS

20" x 20" x 5' Bertram.
24" x 24" x 6½' Bertram.
25" x 25" x 12' Lodge & Davis.
36" x 36" x 10' Pond, two heads
40" x 40" x 12' New Haven, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
Monarch, vertical (2).
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16" Petrie, back geared.
16" Canada Mach. Corp., back geared.
16" Cincinnati, back geared.
24" Gould & Eberhardt, back geared.
24" Bertram, back geared.
30" Morton, back geared, draw cut.

MISCELLANEOUS

6" and 12" Racine Hack Saws.
4" and 6' Robertson Hack Saws.
4½" Martin Cutting-off Machine.
No. 2 Grant Rotary Riveting Hammer.
No. 1A High-speed Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 4 GA Brown & Boggs Punching Press.
No. 18 Can. Hanson & Van Winkle Power Press.
No. 180 Brown-Boggs Power Presses.
No. 3 Goldie & McCulloch Hydraulic Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
1500-lb. Toledo Drop Hammer.
150-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

Say you saw it in Canadian Machinery

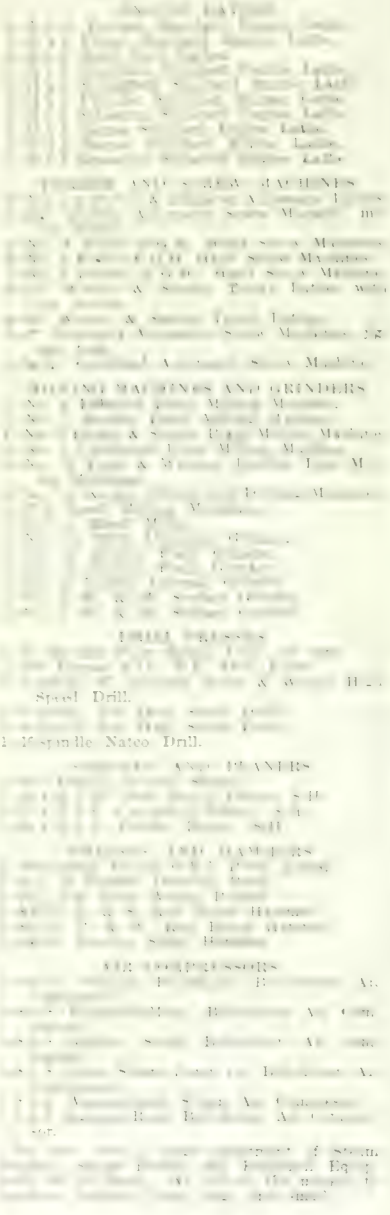
RIVERSIDE
Machinery Depot

We Own Every Tool Offered

NEW MACHINE TOOLS

For Immediate Delivery

USED MACHINERY



RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

Good Used Equipment

Traveling Cranes.

30 ton Browning Trolley, 5 ton aux., 56½ ga. (new).
20 ton Shaw, 56' 3" span, 110 V.D.C.
10 ton Case, 58' 3" span, 220 V.D.C.
20 ton Box, 49' span, 220 V.D.C.
10 ton P. & H., 48' span, 110 V.D.C.

Punches and Shears.

Single 48" tht., cap. 3 x 1¼", Providence.
Single 6" tht., cap. ⅞ x ⅞", Cleveland.
Single 15" tht., cap. ¾ x ½" (hand) new Doty.
Double 15" tht. cap. ¾ x ¾" Fischer.
Double, Queen City, 12" thts., cap. ⅝" x ⅝".
Double 12" blades, bar shear, cap. 2" sq., crucible.
Univ. Plate Shear, 18" blades, cap. ¾", Cleveland belted.
Univ. Plate Shear, 26" blades, cap. ½", Lewis belted.
Guillotine Shear, cap. 2½" sq., belted, Perkins No. 6.
Guillotine Shear, No. O. H. & J., 6 and 7" blades (2).
Guillotine Shear, Fisher, 21" blade, cap. 8 x 2".
Squaring Machine 120", cap. 3/16".

Miscellaneous.

Bolt Cutter, Acme 2", Class A, single head, dies.
Boring Mill, 10' Niles, Vertical, 2 heads.
Forging and Upsetting Machine, 1½" Acme, with dies.
Forging and Upsetting Machine, 2½ Ajax.
Hammer, 80-lb. Bradley, Cushion Helve.
Hammer, 35-lb. Maggowan & Finigan (Perfect), belted.
Rotary Planer, 36" Cleveland, belt driven.
Rotary Planer, 60" Cleveland, motor 60 cy., 440 V.
Milling Machine, No. 24 Osterlein Universal.
Pipe Machine, 8" E. C. & B.
Pipe Machine, No. 11 Jarecki.

GOOD CONDITION.
PROMPT SHIPMENT.

McGoy-Brandt Machinery Co.
216-18 Penn Ave.
PITTSBURGH, PA.

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15" three-jawed chuck.
1—Lathe, 28" swing, 8' bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—20" Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15" three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 36" wheel.
1—Lathe, 14" swing, 6' bed.
2—Ford Smith Shell Grinders, complete.
1—17" LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16" Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¾ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—35 H.P. Canadian General Electric Motor, complete with starting box.
1—50 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—6 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

Long-distance messages---telegrams

are frequently received in answer to ads in this section. Readers realize the importance of getting in touch with advertisers at once. And again, this illustrates how closely the section is followed.

Have you any proposition that will interest our readers? Do you want equipment or help? If you do, here is the place to make your wants known. Your ad will get the attention of the men in the office and the men in the shop.

Mail your copy now for next week's issue.

Canadian Machinery
Classified Advertising Section
143 University Ave., Toronto, Ont.

Machine Tools—Look Here For Your Wants

BORING MACHINES Vertical
- 32" Bullards, 1 turret head.
- NEW 36" Gisholt, one swivel, turret head, motor driven.
- 35" Bausch, 2 heads.
- 42" Bausch, 2 swivel heads.
- 42" Bullard, two swivel heads.
- NEW 8' Bickford, 9-" table, 2 swivel heads, Feb. delivery.
- 40" Niles, 2 swivel heads.

BORING MACHINES—Horizontal.
- No. 2 Barrett, 5" bar.
- London, 6" bar.
- Beaman & Smith, 7" spindle.
- Barrett, 8" bar.

BULLDOZERS.
- No. 9 Williams & White, belt drive.
- No. 12 Ajax, single pulley drive.
- No. 23 Williams & White, belt drive.
- No. 26 Williams & White, belt drive.
- No. 29-U Williams & White, arranged for motor drive.

CRANES Traveling.
- 8-ton Chesholm & Moore, 13½' span, hand power.
- 10-ton Electric, 47' span, 25' lift, 2 motors.
- 15-ton Niles, 72' span.
- 10-ton Whiting, 3 motors, 24' span.
- 60 ton Niles, 61' span.

CRANES—Locomotive.
- 10-15-ton McMyler Broad gauge Steam Locomotive, 60' boom, bucket, 3 drums.
- 15 ton Industrial Locomotive, 8 wheel, 40' boom, bucket.
- 15 ton Brown Hoist Locomotive, 36' boom, bucket, 8 wheels.
- 20-ton Orton & Steinbrenner, steam locomotive, 8-wheel, double drum, 37' boom, bucket.

CUTTING-OFF MACHINES.
- NEW 4½" Davis.
- Davis, 4½".
- 9½" Williams.
- NEW 6" Davis.

DRILLING MACHINES Radial.
- NEW 3' Mueller, speed box drive; Dec. del.
- NEW 3' American, Sensitive, tapping attachment.
- 4' Mueller, plain, speed box drive.
- 4½' Full Universal, cone drive.
- NEW 5' Western Plain, with motor.
- NEW 5' Niles Universal, with motor.
- NEW 5' Mueller, speed box drive; Dec. delivery.
- NEW 5' Baush; January delivery.
- NEW 6' Baush; January delivery.
- 6' Pond, cone drive.
- NEW 6' Triumph, motor drive; Dec. delivery.

DRILLING MACHINES Heavy Duty.
- D-2 Colburn Heavy Duty, 3½" cap., arranged for motor drive.
- Foote-Burt Heavy Duty, 2½" capacity.
- No. 310 Baker, single pulley drive, late type, arranged for motor drive.
- Moline Hole Hogs, heavy duty, 2⅜" cap.

DRILLING MACHINES—Sliding Head.
- NEW 24" Barnes, Drills and Tappers.
- NEW 24" Barnes, Drills.
- NEW 28" Sibley.

DRILLING MACHINES Multiple Spindle
- 4-spindle 20" Barnes, all geared.
- No. 5 Fox, 12-spindle, 1" capacity.
- 6-spindle Rockford; Economy type.

GEAR CUTTING MACHINES
- No. 3 Brown & Sharpe Auto Gear Cutter.
- 36" Newark.
- No. 4 Brown & Sharpe, latest model, cap. 48" x 10".
- NEW 6" Standard Gear Cutter, spur.
- 15" Gleason Bevel Gear Planer.
- 20" Grant-Lees Gear Hobber, bevel spur, and spiral attachment.
- 24" Becker-Brainard.
- NEW 2" Flather, solid pattern.
- 36" Fellows Gear Shapers.
- NEW 27" Gleason Gear Bevel Planer. Feb delivery.
- 72" Gould & Eberhardt, for spur and bevel.

GRINDERS—Universal for Cutters, Drills, Reamers, Etc.
- NEW No. 190 Wells.
- No. 1 Cincinnati.
- NEW Premier, Universal.
- NEW Wilmarth & Morman style B K.
- NEW Walker No. 1, outfit B.
- NEW No. 1 Wood Universal.
- NEW No. 2 Wood Universal.
- NEW Walker No. 2, outfit K, capacity 9"x26".
- NEW No. 2 Oesterlein Universal.
- NEW LeBlond.

GRINDERS—Cylindrical. Plain.
- NEW 8" x 18" Modern Self-contained.
- NEW 8" x 30" Modern Self-contained.
- NEW 12" x 24" Modern Self-contained.
- 12" x 36" Modern Self-contained.
- 12" x 42" Landis Self-contained.
- 12" x 48" Modern Self-contained.
- NEW 10 x 36" Norton.
- 14 x 50 Norton.
- NEW 10 x 72 Norton; Plain.
- 12 x 96" Springfield.

GRINDERS Cylindrical Universal
- NEW No. 2 Bath, 9" x 20".
- NEW No. 2 Walker; 9" x 26".
- NEW 2½ (10" x 34" Bath.
- NEW Thompson 10 x 48"
- No. 3 (12" x 36" Brown & Sharpe.
- 12" x 42" Landis.
- No. 4 Cincinnati, capacity 12 x 72".

GRINDERS Internal
- NEW No. 6 Modern, capacity 16" x 18"
- No. 70 Heald.
- No. 75 Heald.

GRINDERS—Cylindrical.
- No 60 Heald, single pulley drive.

GRINDERS—Surface.
- NEW No. 1 La Salle, Plain.
- NEW No. 1½ Walker's, complete.
- NEW No. 2 American, with Walker No. 2A, Plain Flat Mag. Chucks.
- NEW No. 2 Reel (same as B & S).
- 3' Pratt & Whitney Vertical, Magnetic Chuck.

HAMMERS Board Lift Drop.
- No. 4 Standard Machinery Co., 400 lb.
- E. W. Bliss, 8000 lb.
- 1500-lb. Toledo.

HAMMERS—Steam Forging.
- 450-lb. Bell.
- 800-lb. Niles, single frame.
- 3500-lb. Chambersburg Steam Drop Hammers.
- 2—5000 lb. Chambersburg Steam Drop Hammers.
- 7000-lb. Morgan Special Double Stand.

KEYSEATERS.
- NEW No. 2 Davis.
- No. 2 Mitts & Merrill.
- Colburn 4", capacity 4½" stroke.
- No. 2 Knowles, 60" stroke.
- NEW No. 1 Davis.

LATHES—Manufacturing, not Screw Cutting
- NEW No. 7 Harding Brothers, Bench Lathes.
- 16" x 8' Fairbanks-Morse, Heavy Duty.
- NEW Simplex 16" x 8'.
- Reed Prentice Shell Lathes for 4" or 18 lb American Shells.
- 25" Barrett Heavy Duty Boring Mill.
- 20" x 10' Hindman, High Duty.
- 36" x 30' Heavy Duty N.B.H. Projectile Boring, Motor Driven; almost new.

LATHES Engine.
- NEW 14" x 6' Bradford Quick Change.
- NEW 15" x 6' Rockford.
- NEW 14" x 6' Hendey, Geared Head.
- NEW 16" x 6' Cleveland Tool Room Lathes complete equipment.
- NEW 16" x 8' Bradford Quick Change.
- NEW 17" x 8' National Quick Change Gears.
- NEW 17" x 8' LeBlond Pan Bed, Quick Change Gears.
- 18" x 16' Hendey quick change gear, 14" chuck.
- NEW 20 x 10 Bradford Quick Change.
- NEW 20" x 10' Cleveland Geared Head.
- NEW 20" x 12' Bradford Quick Change.
- NEW 21" x 10' Porter, S.B.G.
- 22" x 10' Putnam, Oil Pan and Pump.
- NEW 24" x 10' Bradford Quick Change.
- NEW 24" x 12' Bradford, Quick Change.
- NEW 24" x 12' American.
- 24" x 14' American, Quick Change.
- 24" x 22' Bullard, Triple Geared, Taper Attachment.
- NEW 26" x 48" x 12' McCabe Double Spindle.
- NEW 26" x 48" x 22' McCabe Double Spindle.
- NEW 28" x 12' Conradson Duplex Helical Drive, Screw Cutting Type.
- NEW 30" x 14' American Double Back Geared, Quick Change.
- 30" x 14' Lodge & Shipley Single Pulley Drive, Quick Change.
- NEW 32" x 12' Pittsburg Pattern.
- NEW 42" x 24' Triple, Geared, Houston Sturtevant Heavy Duty.
- 42" x 28' Hamilton, Triple Geared, Quick Change, raising blocks to 54".
- 50" x 24' Prentiss.
- 52" x 22' Worcester, Triple Geared.
- 58" x 18' 6" Dodge Lathe, Very Heavy.
- NEW 60" x 16' Putnam Triple Geared Face Plate Drive 5-step Cone; 6½" belt.
- 84" x 18' Special Boring Lathe.

LATHES—Turret.
- NEW 21" Gisholt H-21.
- NEW 24" Gisholt I-24.
- 2 x 24 Jones & Lamson.
- NEW 18" Libby.
- 24" Libbey, Universal Facing Head, 4-jaw chuck.
- 20" Steinle, almst new.
- 6A Potter & Johnson.
- No. 24 New Britain, arranged for motor drive, almost new.

MILLING MACHINES Knee Type Universal
- No. 2 Kempsmith, Vertical Attachment.
- No. 2 Kempsmith 13" Dividing Head.
- NEW No. 2 Rockford High Power.
- NEW No. 2 Garvin.
- No. 2 LeBlond.
- NEW No. 3 Owen.
- NEW No. 3 Cincinnati High Power.
- No. 3-H LeBlond Heavy Duty; almost new.
- No. 25 Oesterlein.
- NEW No. 34 Oesterlein Heavy Duty; latest type.

MILLING MACHINES Knee Type Plain.
- NEW No. 1 Kempsmith.
- NEW No. 3½ American Back Gear.
- NEW No. 2 Rockford.
- NEW No. 2 Kempsmith.
- No. 3 LeBlond.
- NEW No. 3 Cincinnati.
- No. 5 Kempsmith.
- NEW No. 3 Owen.

MILLING MACHINES Duplex
- No. ½ Van Norman; almost new.
- No. 2 Garvin Spiral Drive.

MILLING MACHINES Hand.
- NEW No. 1 Rockford, with 30" column.
- NEW No. 2 Rockford on column.
- NEW No. 3 Rockford on column.
- NEW No. 3 Rockford on column power feed.

MILLING MACHINES—Vertical.
- No. 2 Pratt & Whitney.
- No. 3 Cincinnati Heavy Duty.
- NEW No. 4 B. Becker.
- NEW No. 5 B. Becker, Rotary Table.
- Newton Vertical, Continuous, Motor Driven, for shell work.

MILLING MACHINES Planer Type
- No. 2 Beaman & Smith.
- Ingersoll Slab 16" x 48" capacity.
- NEW 17" x 5' Exton Planer Type.
- 30" x 30" x 8' Ingersoll No. 928 Single Spindle with Motor.

MILLING MACHINES Lincoln Type
- NEW No. 1 Godley & Elliott Briggs Type.
- NEW No. 1 American.
- NEW Sellers Auto. Quick Return.

PLANERS.
- NEW 24" x 24" x 6' Powell Single Head.
- 24" x 24" x 10' Gray; 1 Head.
- 36" x 36" x 10' American; 2 Heads.
- 36" x 36" x 14' Cincinnati 2 Heads, motion.
- 36" Rotary Planer, Motor Driven.
- 36" x 36" x 8' Gray; One Head.
- 40" x 40" x 11' Niles; Four Heads.
- 42" x 42" x 12' Butler, High Speed 3 Heads almost new.
- 48" x 48" x 12' Scott, Heavy Type, Milling Attachment, on Rail.
- 52" x 48" x 15' Betts; 2 Heads.
- 60" x 60" x 16' Betts; 2 Heads.
- 60" x 60" x 21' Pond; 3 Heads.
- 72" x 60" x 14' Smith Globe; 2 Swivel Heads.
- 62" x 62" x 20' Canada Tool Works Planer; 2 Heads.

SCREW MACHINES Hand
- No. 0 Brown & Sharpe.
- NEW No. 2 Foster Geared Friction Head.
- NEW No. 4 Foster Geared Friction Head, Power Feed to Turret Slide.
- NEW No. 5 Foster All Geared Power Feed to Turret Slide.
- NEW No. 5 Foster All Geared Head, Power Feed to Turret; Power Cross Feed.
- NEW No. 6 Foster Geared Friction Head, Power Feed to Turret; Power Cross Feed.
- NEW No. 7 Foster Geared Friction Head, Power Feed to Turret, Power Cross Feed.
- NEW No. 10 Foster Geared Friction Head Power Feed to Turret; Power Cross Feed.
- NEW 2¼" Dreses F.G.F. Power Feed.

SCREW MACHINES Automatic
- NEW ⅝" Cleveland, Model A.
- NEW ¾" Gridley Mult. Spindle, Belt Driven.
- NEW 2¼" Gridley Mult. Spindle, Belt Driven.
- NEW 1¾" Gridley Mult. Spindle, Belt Driven.
- NEW 2¼" Gridley Mult. Spindle, Belt Driven.
- NEW 3¼" Gridley Single Spindle, Belt Driven.
- No. 0 Brown & Sharpe.
- No. 2 G Brown & Sharpe.
- No. 515 National Acme.

SHAPERS
- NEW 16" Springfield.
- 16" Motor Driven Rockford.
- NEW Barker 24".
- NEW 24" Milwaukee.
- NEW 24" Potter & Johnson Universal Rotary Table.
- 26" Springfield.
- 30" Morton Draw Cut.

SHEARS
- Waterbury-Farrell Aligator, capacity 2½".
- Cincinnati Gap, 17" gap, 78" blade; ¾" capacity.
- No. 411 G Toledo Squaring, capacity 36", weight 12,600 lbs.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. | **CINCINNATI, OHIO** Union Central Life Bldg. | **CLEVELAND, OHIO** Leader News Bldg. | **NEW YORK CITY** Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

BUY VICTORY BONDS—SAFEST INVESTMENT IN CANADA TO-DAY.

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(Partial List)

REDUCING PRESSES

Four No. 60½ Bliss, with rack and pinion movement, adjustable stroke from 4 to 42 : **especially adapted for drawing shells up to 21" in length.**

NEW SHAPERS

24" Hollingsworth Improved Triple Geared Crank

PIPE MACHINES

16" Saunders, 8" to 16" capacity
10" Cox, 2½" to 10" capacity
8" Saunders, 2" to 8" capacity
8" Eaton Cole Burnham, 2½" to 8" capacity
6" Stoever, 1¼" to 6" capacity
Two 6" Curtis & Curtis, 2½" to 6" capacity
Two 4" Morris, 2½" to 4" capacity
4" Armstrong, 2" to 4" capacity
2" Borden, ½" to 2" capacity
2" Jarecke, ¾" to 2" capacity

MISCELLANEOUS

36" x 18' Farrell Foundry Engine Lathe, face plate drive
32" x 22' Gleason Engine Lathe, raising blocks to swing 66", double back geared
24" x 24' Jones & Lamson sliding head Flat Turret Lathe, bar equipment
21" x 24' Jones & Lamson cone head Flat Turret Lathe
21" Gisholt Lathe
18" Gisholt Lathe
3½" Acme Bolt Cutter
36" x 36" x 12' Ingersoll heavy duty Horizontal Slab, adjustable rail
No. 2 Barrett Horizontal Cylinder, Boring Machine, 5" bar
No. 73½ Bliss Straight Sided Geared Press, 4" stroke
Four 48" Newton Automatic Gear Cutters or Hobbing Machines

New York Machinery Exchange, Inc.

50 CHURCH STREET - NEW YORK CITY

Shell Manufacturers

Who expect **New Shell Orders** either from **Canada** or the **United States,** may need some of their shell equipment **overhauled** and **repaired** or **rebuilt.** We can handle it **completely, satisfactorily** and **promptly.**

NOW IS THE TIME.

The
Preston Machinery Co., Ltd.
PRESTON :-: ONTARIO, CANADA

There's a man

advertising on page 68 for a position.

Have you a position open that he could profitably fill? If you have, write him. If you have the position and don't think he can fill it, advertise for one who can.

Canadian Machinery
Classified Advertising Section
143 University Avenue, Toronto

IMMEDIATE DELIVERY

DRILLING MACHINES

Leland H.S., B.B., bench type.
No. 1½ Knight Driller and Miller.
32" Hamilton, s.h., b.g., p.f.
32" W. F. & J. Barnes, s.h., b.g., p.f.
20" W. F. & J. Barnes, 4 spindle.
No. 11 P. & W. Multiple, 10 spindles.
3' W. E. Gang Plain Radial.
3½' W. E. Gang Plain Radial.
4' Mueller Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS

Reynolds Hobber.
No. 11 B. & S. automatic.
30" x 9" G. & E. auto. for spur and bevel.
24" x 7" G. & E. for spur.
No. 3—26" B. & S. for spur.
36" Walcott for spur.

GRINDERS

Yankee Drill.
No. 1-½ Cincinnati Cutter and Tool.
No. 2 Woods Universal Cutter and Tool.
No. 23 B. & S. Gear Cutter.
No. 1 Brown & Sharpe Universal.
14" x 20" B. & S. Plain.
Garvin hole grinder.
Gisholt tool grinder.
No. 5 Diamond water tool.
No. 16 Gardner disc grinder.
No. 24 Gardner disc grinder.

LATHES

13" x 5' P. & W., c.r., taper.
14" x 6' Fairbanks, c.r. taper.
16" x 6' Prentice, c.r.
18" x 8' L. & S. pat. head, c.r. taper.
18" x 10' Fitchburg, c.r.
18" x 12' Barker, c.r.
20" x 14' Blaisdall, c.r.
21" x 12' New Haven, c.r.
24" x 13' New Haven, c.r.
36" x 20' American, t.b.g.
36" x 22' New Haven, t.b.g.

PLANERS

24" x 24" x 4' Gray, one head.
24" x 24" x 8' Cincinnati, one head.
26" x 26" x 8' Pease, one head.
30" x 30" x 8' Woodward & Powell, one head.
30" x 30" x 8' Cincinnati, two heads.
36" x 36" x 14' Sellers, one head.
40" x 38" x 14' Putnam, one head.
50" x 50" x 18' New Haven, two heads, two extension heads.

SCREW MACHINES

No. 1 Foster, Plain, A.C. and W.F.
1" B. & S. Plain.
16" P. & W. Plain.
No. 2 Costello, plain head.
No. 2 P. & W. friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞" Cleveland, automatic.

TURRET LATHES

No. 22 Garvin.
16" Lodge & Shipley.
25' Niles.
2 x 24" Jones & Lamson.
3 x 36" Jones & Lamson, chucking equipment.
3 x 36" Jones & Lamson, bar equipment.
21" Gisholt, with taper.
2—24" Gisholt turret lathes, taper attachment.

PUNCHES AND SHEARS

No. 3 American Can.
No. 3 Bauroth, O.B.I.
No. 5 Bauroth Geared, O.B.I.
No. 6 N. American Can.
No. 2 L. & A. Angle Iron Shears, 5"x5"x½" (new).
No. 5 L. & A. Double Punch & Shear, ⅝"x⅝", ⅜"x⅝", 1⅛ rd. (new).
No. 1 L. & A. Multiple Punch (new).
No. 1 L. & A. Horizontal Punch, ½" in 1" (new).

MISCELLANEOUS

No. 0 Mitts & Merrill Keyseater.
50-lb. Bradley Strap Hammer.
¾" Acme Forging Machine.
52" Niles car wheel boring mill.
3" Stover Pipe Machine.
6' x 14" P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

Stocker-Rumely-Wachs Company, 117-121 N. Jefferson St., CHICAGO, ILL.

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AFTER fifteen years' study of the Miner's and Lumberman's wants, we know just what is and what is not required in tools for them.

Practicality has been the keynote of our organization. Experience has aided us in eliminating all unnecessary parts and in perfecting the design of our tools.

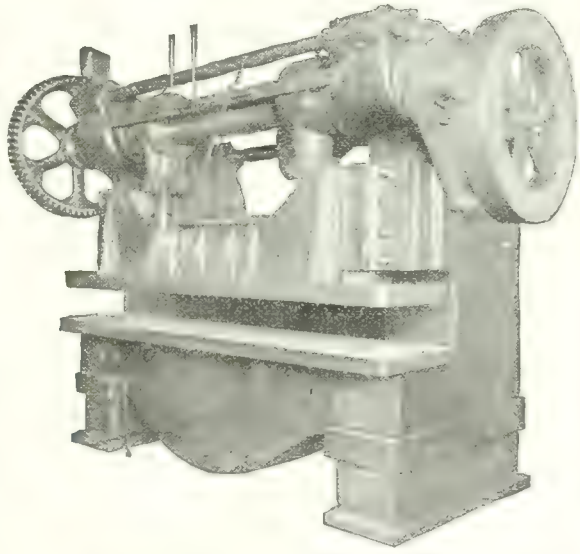
The use of best material and finest workmanship enable us to manufacture tools that are unexcelled.

We make a complete line.

Write us for prices.

J. W. CUMMING & SON, LTD.
NEW GLASGOW, - - CANADA
Wood or Steel, let Cummings make it.

FOR SALE



Large Blanking Press

76" between housings, 8" shaft,
3½" stroke, 8¾" die space.
Very good condition and for immediate delivery.

RIVERSIDE MACHINERY DEPOT
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Help Her to Maintain this Position By Subscribing for Large Blocks of

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It is for you, manufacturers and merchants, to give the lead to those whose daily lives you influence, by subscribing for a substantial block of Canada's Victory Bonds.

The simple fact is, Canada must have more money to carry on her part in the war and extend credit to Great Britain and our Allies.

This Canada must do if our industrial, commercial and agricultural activity is to be maintained.

Since Canada can no longer borrow abroad, the money must be secured here.

Fortunately the money is here. It only remains to get the hundreds of thousands of people with savings to realize what it means to Canada—to them—to you—to insure the success of the Loan.

By subscribing for Canada's Victory Bonds yourself, and tactfully explaining their merits to your employees—you can insure the Bond issue becoming an overwhelming popular success. This Canada relies upon you and every other manufacturer and merchant to do.

So surely as Canada's Soldiers in the Front line trenches are fighting for Freedom, so in a lesser degree do they fight who lend their money to support Canada's Armies in the field.

Money fights to-day, and it is the bounden duty of every Canadian to back Canada's part in the war by buying Canada's Victory Bonds.

Decide now that your concern will take a big block of Canada's Victory Bonds and that your whole establishment will be organized in support of the Loan.

Issued by Canada's Victory Loan Committee
in co-operation with the Minister of Finance
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Shell Manufacturers

Get our Prices on Gauges, Boring Bars Rough Turn Drivers, Etc., for 6 in. SHELL.

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CUT GEARS

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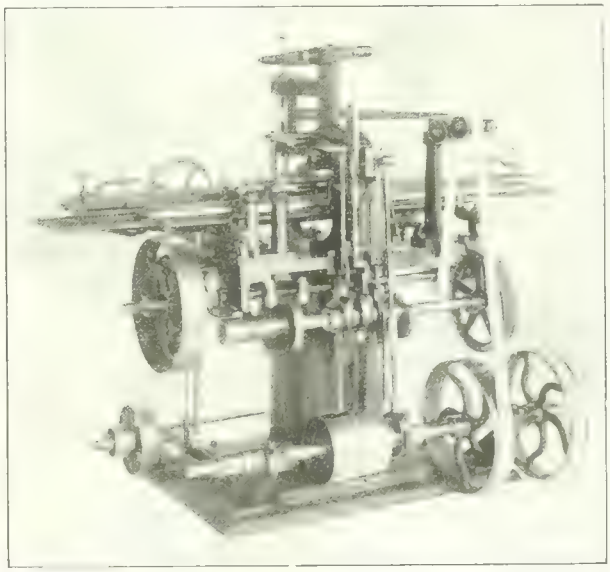
ACCURACY IN CUTTING makes SILENT POWER

We will show here from time to time some machines we build that you may judge our capabilities in this line.



Balance Rail and Kextrame Boring Machine

Manufactured Solely By

TORONTO TOOL CO.,
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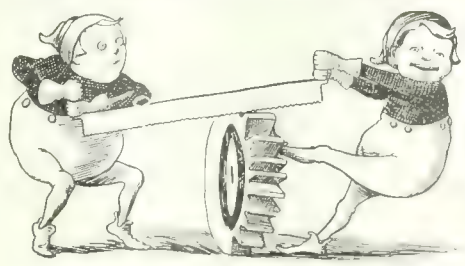
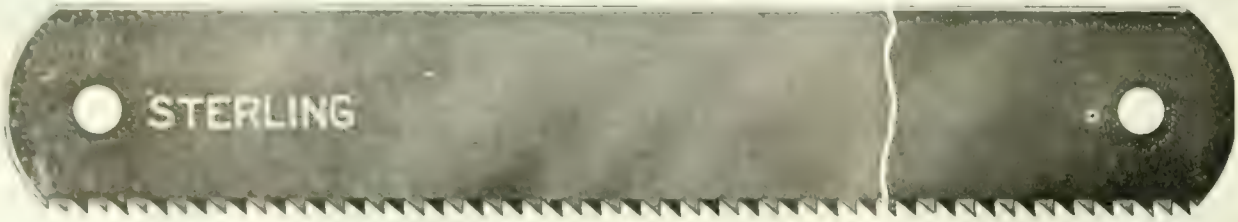
We Cut Gears
Rawhide, Steel, Iron, Brass.



We Make Grinder Heads, Power Hack Saws, Friction Pulleys, Index Heads.
DESIGN AND BUILD SPECIAL MACHINERY
WINNIPEG GEAR & ENGINEERING Co.
197-199 PRINCESS ST., WINNIPEG

"STERLING"

HACK SAW BLADES



A brand once adopted, difficult to replace.

REASONS—High quality of material used, mechanical construction, and special heat treatment.

RESULTS—Economy which means satisfied customers.

Write for information and prices.

DIAMOND SAW & STAMPING WORKS

BUFFALO, N.Y., U.S.A.

More and Better Work

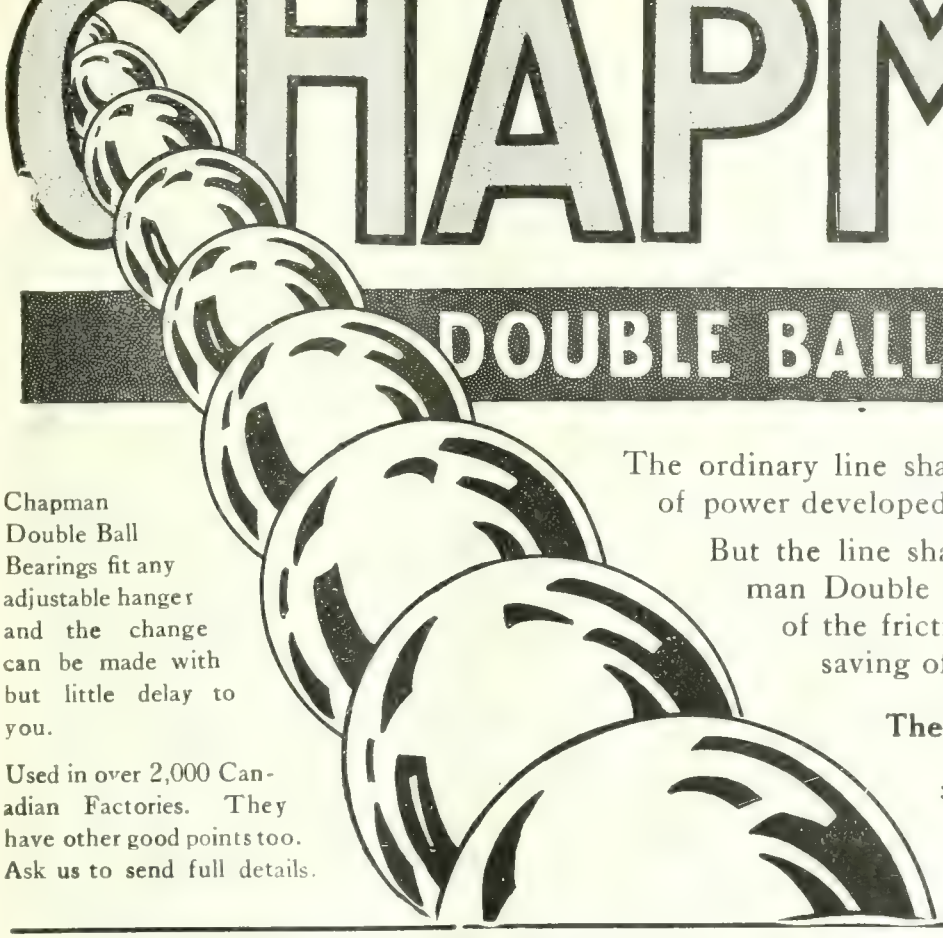
That's the news we get from shops which have introduced

BLOUNT'S GRINDING MACHINES

Cut shows machine for sharpening 10" x 12" x 14" Hack Saw Blades. Has self-lifting, non-rotating, adjustable magnetic chuck. Cups mounted on both ends of chuck and each is mounted in dust-proof, self-aligning spindle made of high-grade steel and bearings. Also Nos. 3 and 4 Self-Feeding Hack Saw Grinding Machines. Also Nos. 1 and 2 Hand Feed Hack Saw Grinding Machines. Also Nos. 1 and 2

CHAPMAN

DOUBLE BALL BEARINGS



Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

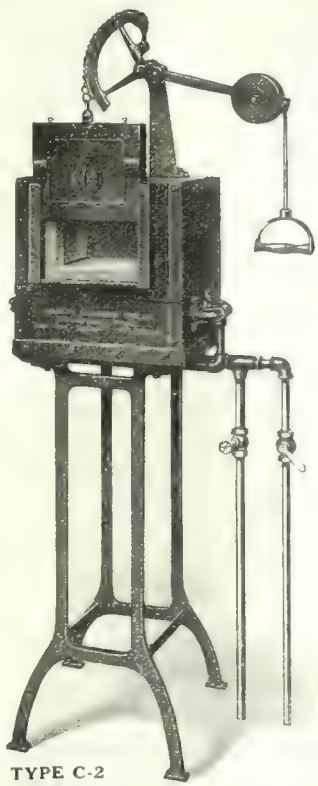
The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

The Right Furnace For Every Purpose



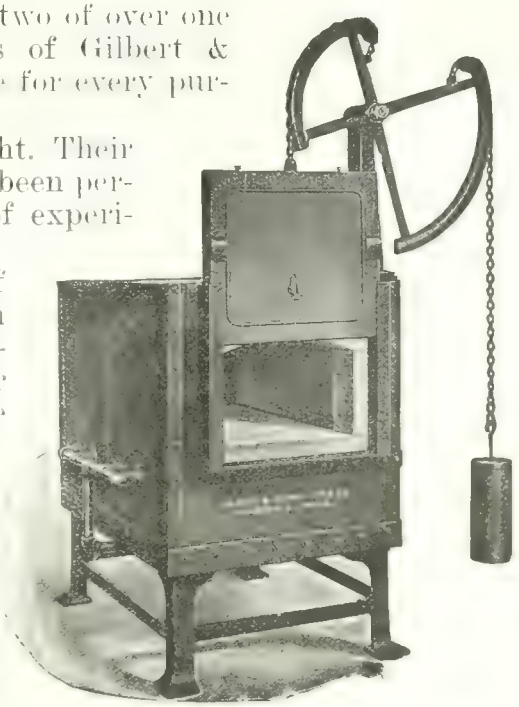
TYPE C-2

THE types shown are only two of over one hundred types and sizes of Gilbert & Barker Furnaces — a furnace for every purpose.

G. & B. Furnaces are built right. Their construction and design have been perfected by our half century of experience.

We offer you the benefit of this experience and thorough knowledge of modern heat-treating methods through our engineering department. The service is free. Put your problems up to us.

Just now we are making prompt delivery of these two types and many others. Send for stock List 24.



TYPE C-15

Gilbert & Barker Mfg. Co. West Springfield, Mass.

Canadian Agents:
James DeVon, 227 Davenport Rd., Toronto, Ont. Williams & Wilson, Montreal, Que.

Known the World Over
Admitted to be Superior

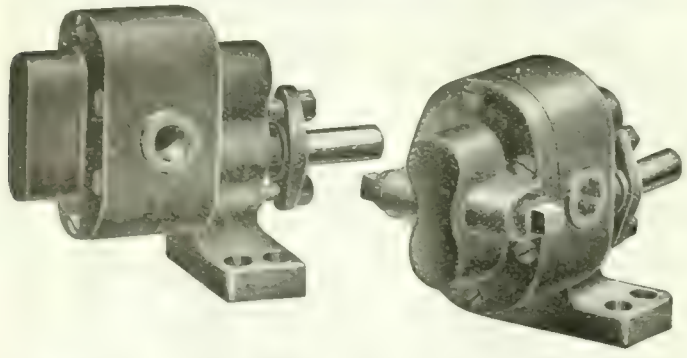
The Racine for Scientific Metal Cutting

Demonstrate the value of this machine in your own shop, on your own work. Our confidence in the ability of this machine is such that we will send it to you on *trial*. This will give you ample opportunity to study the machine from close quarters, to verify our statements regarding simple construction and operation, accuracy and speed, features that stamp our machine in a class by itself.

We invite your inquiries for full information and installation

Racine Tool & Machine Co.
15 Melbourne Ave. Racine, Wis., U.S.A.

RACINE



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

SHEET METAL STAMPINGS

The quality of our production is one grade — THE BEST. Our facilities and equipment enable us to give a very attractive price and prompt service.

Dominion Forge and Stamping Co., Limited
WALKERVILLE, ONTARIO

DROP FORGINGS

IF self-interest be the mainspring of a man's actions, then you should act at once, because the "Clipper" Belt Lacer saves money for you.

Each time a belt breaks from 1 to 150 men and machines are idle.

"Clipper" lacings have been made in 45 seconds. The maximum time required is only three minutes. How long are *your* men and machines idle when a belt breaks?

Clipper Belt Lacer Company

976 Front Avenue Grand Rapids, Mich.

STOP THE SPOILAGE

One of the most disheartening problems of shop and mill is the spoilage of material and loss of labor time. Darkness increases the chances of larger errors, and tends to handicap your production

LACO NITRO LAMP "THE LIGHT THAT GIVES MORE LIGHT"

is the solution to this "profit losing" question. It will give you 24 hours of bright, white light, assisting skilled labor to render better work with less spoilage and errors.
These Nitro Laco Lamps produce more and better light per watt than any other type of lamp. We guarantee their long service

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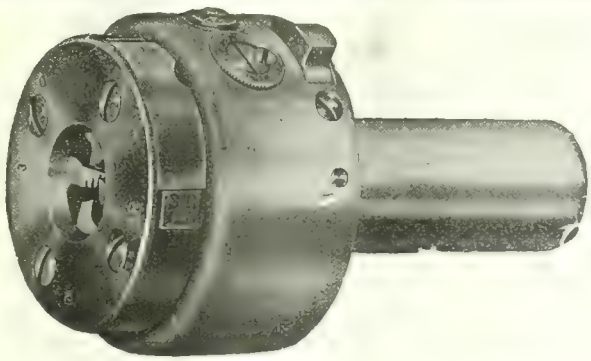

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The quick release will allow cutting right up to a shoulder when necessary.

These features are distinctly an H. & G. Automatic Self-Opening Die head quality that makes it desired among other tools of similar nature.

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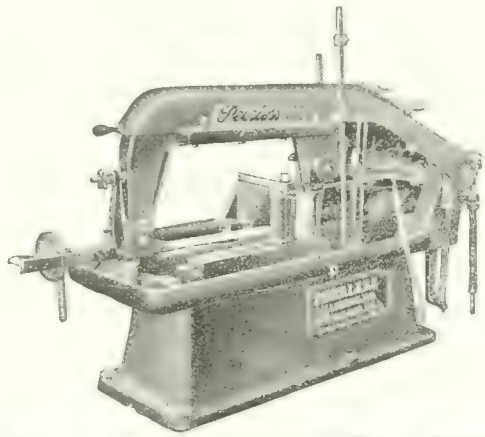

Just what a [illegible] reports after making a comparative test in Peerless High Speed Saw cutting [illegible] steel bar made on an [illegible] machine under [illegible] conditions. We would be glad to have [illegible] Peerless Speed and other [illegible] tools now in [illegible] plant.

[illegible] that will substantiate this report. The [illegible] placed their order [illegible] and [illegible] shipments have been [illegible] by express. The express charges on these shipments amounted to about $[illegible]. At the same time they saved [illegible] and [illegible] per cent.

When a firm is urgently in need of a tool [illegible] will delay production several days awaiting delivery of a [illegible] made, it pays to own an emergency [illegible] tool. Also this [illegible] to find room [illegible] such [illegible] could be utilized. Write us stating the Peerless High Speed Saw before deciding on any other equipment.

From the [illegible] and repeated orders received would [illegible] this tool [illegible] all metal cutting standards. We are [illegible], very [illegible] to make [illegible] of [illegible] have found that will allow [illegible] and examine same before deciding to purchase.

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Drill Chuck

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Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

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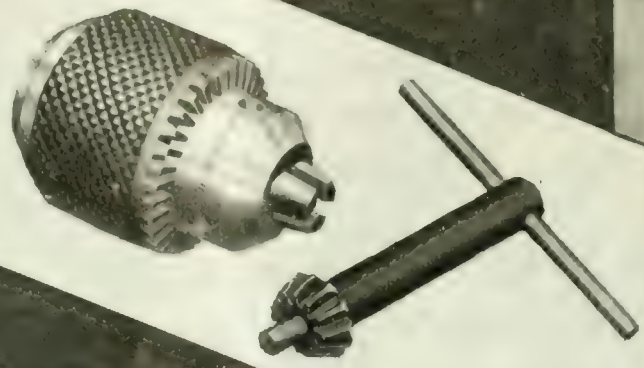

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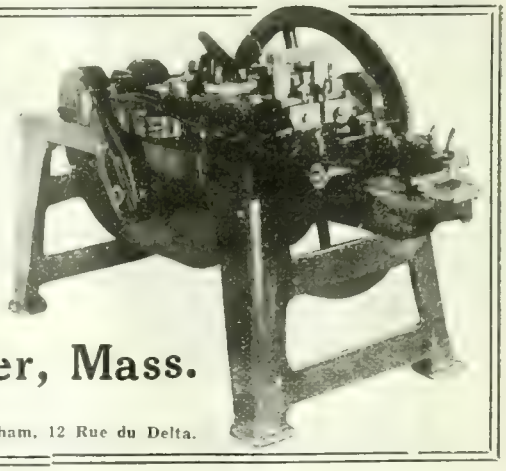

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IT WILL NOT CRACK

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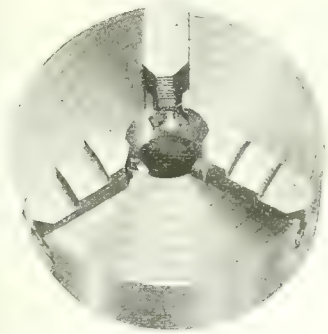

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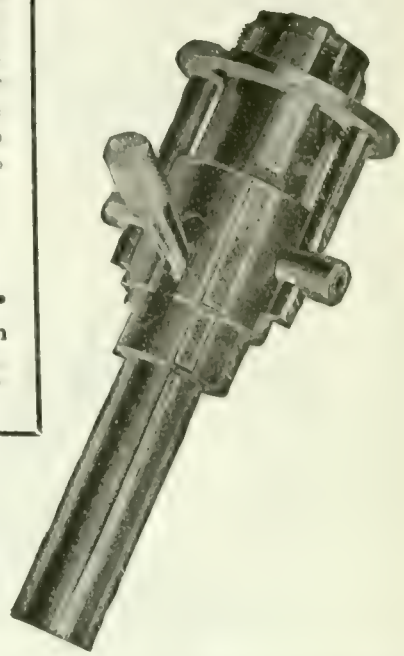

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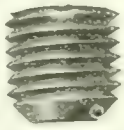
(U.S. Patent, June 7, 1910)



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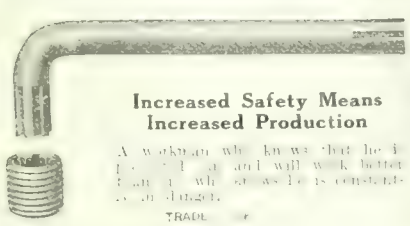

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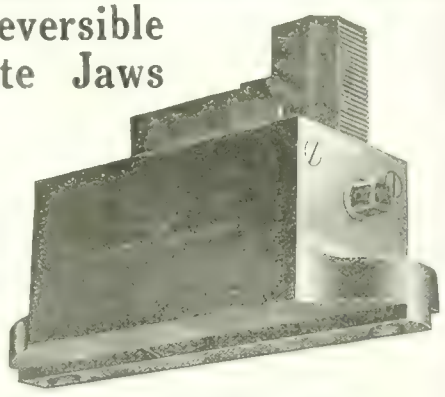

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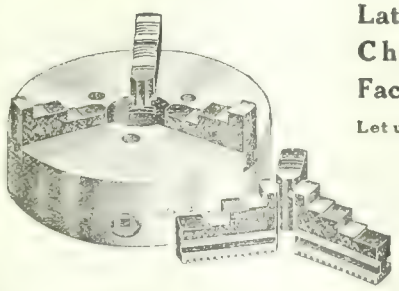

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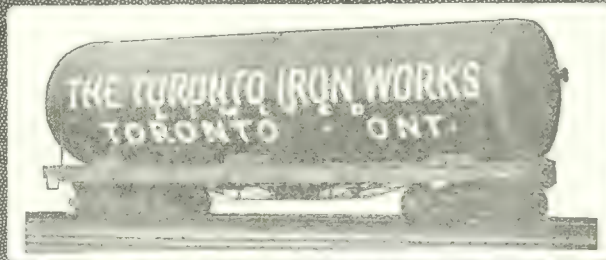

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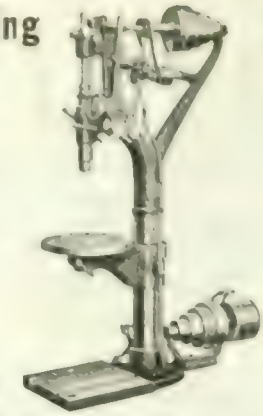

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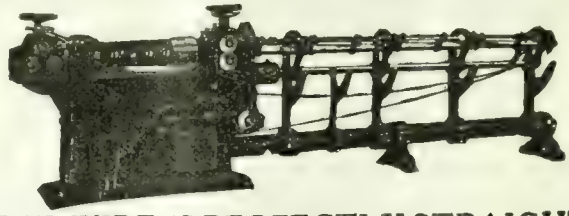

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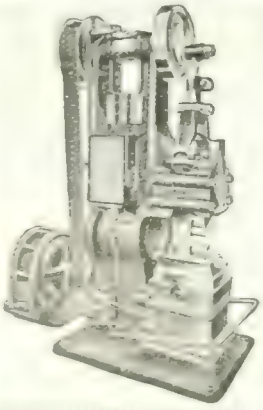

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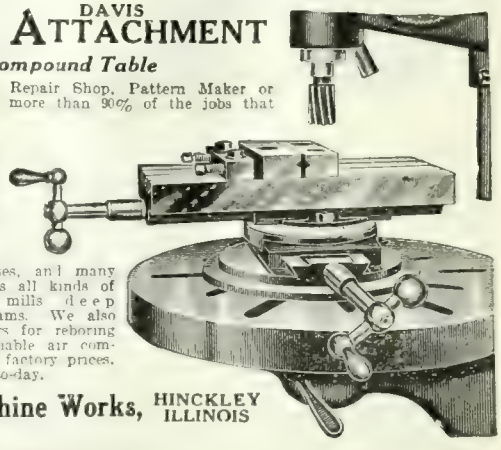

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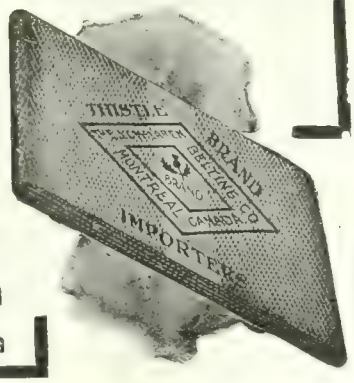

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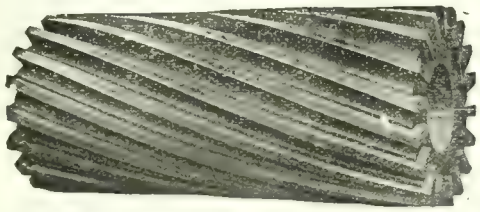

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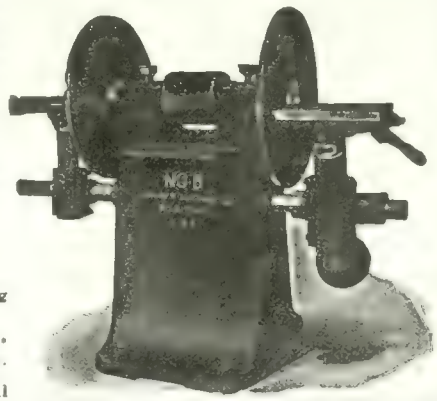

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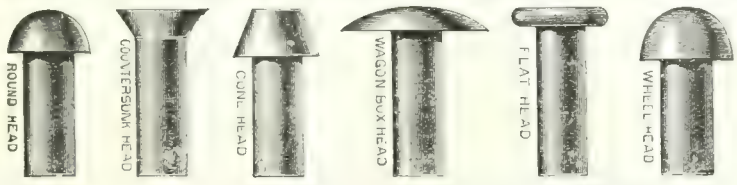

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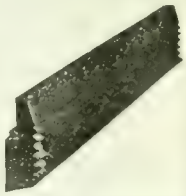

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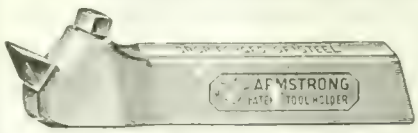

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Can B K Morton, Montreal, Que.
Carborundum Co., Niagara Falls, N.Y.
Foss & Hill Machy. Co., Montreal.
Ford-Smith Mach Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
Norton Co., Worcester, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

ACETYLENE
Carter Welding Co., Toronto, Ont.
Commercial Acetylene Welding Co., Inc., Toronto
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

ACETYLENE GENERATORS
Commercial Acetylene Welding Co., Inc., Toronto
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

ACCUMULATORS, HYDRAULIC
Canadian Fairbanks-Morse Co., Montreal
Charles F. Elmes Eng. Works, Chicago
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Smart-Turner Mach Co., Hamilton Ont.
William R Perrin, Ltd., Toronto

ADAPTER PLATES
Jas. McKay Co., Pittsburgh, Pa

AIR RECEIVERS
Can. Ingersoll-Rand Co., Sherbrooke, Que.
The Jenckes Mach Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.

AIR WASHERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.

ALUMINUM
Canada Metal Co., Toronto
Tallman Brass & Metal Co., Hamilton

ALLOY, STEEL
Can B. K Morton, Toronto, Montreal
H. A. Drury Co., Ltd., Montreal
Hawkridge Bros. Co., Boston, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Standard Alloys Company, Pittsburgh, Pa.
Vanadium Alloys Steel Co., Pittsburg, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

ARBORS
Canadian Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland
Garlock-Walker Machinery Co., Toronto, Ont.
Morse Twist Drill & Mach Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal Ltd H W Montreal Que.
Pratt & Whitney Co., Dundas, Ont.

AUTOGENOUS WELDING AND CUTTING PLANTS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.

AUTOMATIC MACHINERY
Baird Machine Co., Bridgeport, Conn
Garlock-Walker Machinery Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
McClean & Son, F. W., Niagara Falls, Ont.
Riverside Machinery Depot, Detroit, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd H W Montreal Que.
Pratt & Whitney Co., Dundas, Ont.
Roelofson Machine & Tool Co., Toronto, Can.
A. R. Williams Machy. Co., Toronto

BABBITT METAL
Aikenhead Hardware Co., Toronto, Ont.
Baxter & Co., Ltd., J. R., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal
Canada Metal Co., Ltd., Toronto
Can B K. Morton, Toronto, Montreal
Foss & Hill Machy. Co., Montreal.
Host Metal Co., Toronto
Magnolia Metal Co., Montreal
Petrie, Ltd., H. W., Toronto, Ont.
Tallman Brass & Metal Co. Hamilton
Wilkinson & Kompass, Hamilton, Ont.

BALL BEARINGS
Canadian Fairbanks-Morse Co., Montreal
Can S K F Co., Toronto, Ont.
Chapman Double Ball Bearing Company, Toront

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn
Cleveland Wire Spring Co., Cleveland

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Charles F. Elmes Eng. Works, Chicago, Ill.
Monarch Brass Mfg. Co., Toronto, Ont.
Niles-Bement Pond Co., New York

BASE PLATES
Jas. McKay Co., Pittsburgh, Pa.

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich

BELT DRESSING AND CEMENT
Baxter & Co., Ltd., J. R., Montreal, Que.

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
Foss & Hill Machy. Co., Montreal
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING, BALATA
Baxter Co., Ltd., J. R., Montreal, Que.
Can B K Morton, Toronto, Montreal
Federal Engineering Co., Toronto, Ont.

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal
Goodyear Tire & Rubber Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Whitney Mfg. Co., Hartford, Conn.

BELTING, CONVEYOR
Goodyear Tire & Rubber Co., Toronto, Ont.

BELTING, LEATHER
Canadian Fairbanks-Morse Co., Montreal
Can. B. K. Morton, Toronto, Montreal
Graton & Knight Mfg. Co., Worcester, Mass.
Goodyear Tire & Rubber Co., Toronto, Ont.
Jones & Glassco, Montreal.
McLaren, J. C., Belting Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Baxter & Co., Ltd., J. R., Montreal, Que.
Bennett, W. P., 51 Montford St., Montreal, Que.
Dominion Belting Co., Hamilton, Ont.
Federal Engineering Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

BENCH LEGS, STEEL
New Britain Mach. Co., New Britain, Conn.

BENCH DRAWERS, FRICTIONLESS
New Britain Mach. Co., New Britain, Conn

BENDING MACHINERY
John Bertram & Sons Co., Dundas
Bertrams, Limited, Edinburgh, Scotland
Brown-Boggs Co., Ltd., Hamilton, Can.
Can Blower & Forge Co., Kitchener, Canada
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont
Charles F. Elmes Eng. Works, Chicago
Jardine, A. B. & Co., Hespeler, Ont.
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal Que
Steel Bending Brake Works, Chatham, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BINS, STEEL
The Jenckes Mach. Co., Ltd., Sherbrooke, Que
MacKinnon, Holmes Co., Sherbrooke
Toronto Iron Works Ltd., Toronto, Ont.

BLASTING MACHINES, SHOT AND STEEL GRIT
Gray Mfg. & Mach. Co., Toronto, Ont.
Pangborn Corporation, Chicago, Ill

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
R. E. T. Pringle, Ltd., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Sturtevant Co., B. F., Galt, Ont.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
L'Air Liquide Society, Montreal, Toronto
Prest-O-Lite Co., Inc., Toronto, Ont.

BLUE PRINTING MACHINERY
Mullmer-Enlund Tool Co., Syracuse, N.Y.

BOARTZ
Francis & Co., Hartford, Conn
Geo. A. Joyce Co., Ltd., New York, N.Y

BOILERS
The Jenckes Mach. Co., Ltd., Sherbrooke, Que
MacKinnon, Holmes Co., Sherbrooke
Marsh & Henthorn, Ltd., Belleville, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
Sterling Engine Works, Winnipeg, Man.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

BOLTS
Aikenhead Hardware Co., Toronto, Ont.
Cumming & Son, J. W., New Glasgow, Canada
Galt Machine Screw Co., Galt, Ont.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

BOLT AND NUT MACHINERY
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Goodhue & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machinery Co., Toronto

BOLT THREADING MACHINERY
Landis Machine Co., Waynesboro, Pa.
Victor Tool Co., Waynesboro, Pa.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co. of Canada, Toronto
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, UPRIGHT AND HORIZONTAL
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York
Petrie of Montreal Ltd H W Montreal Que.
Roelofson Machine & Tool Co., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Stow Mfg. Co., Binghampton, N.Y.

BORING MACHINES, STOVE AND COAL
Cumming & Son, J. W., New Glasgow, Canada

BORING AND TURNING MILLS
John Bertram & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
R. E. T. Pringle, Ltd., Toronto, Ont.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland
New Britain Mach. Co., New Britain, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.

BRASS AND COPPER BARS, RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BRASS FOUNDERS
St. Lawrence Welding Co., Montreal, Que.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto, Ont.
Warner & Swasey Co., Cleveland
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
A. R. Williams Machy. Co., Toronto

BRIDGES, RAILWAY AND HIGHWAY
The Jenckes Mach. Co., Ltd., Sherbrooke, Que
MacKinnon, Holmes Co., Sherbrooke

BRONZE RODS AND SHEETS
Brown's Copper & Brass Rolling Mills, New Toronto

BUBBLERS
Pure Sanitary Dr'g Fountain Co., Hardenville, Mass.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton, Ont.
Foss & Hill Machy. Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.

BUCKETS, CLAM SHELL, CRAB, DUMP

BULLDOZERS

BURNERS, OIL AND NATURAL GAS

BURRING REAMERS

BURRS, IRON AND CUTTER

CANNERS MACHINERY

CARS, INDUSTRIAL

CARS, STEEL BODY

CAR MOVERS

CARTRIDGE MAKING MACHINERY

CASTINGS, ALUMINUM, BRASS, BRONZE, COPPER

CASTINGS, GRAY IRON

CASTINGS, STEEL CHROME AND MANGANESE STEEL

CASTINGS, MALLEABLE

CASTINGS, NICKEL STEEL

CEMENT MACHINERY

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block & Mfg. Co., Philadelphia, Pa.

CHAIN DRIVES

CHEMISTS
Can. Inspection & Testing Lab., Montreal, Que.

CHESTS, TOOL

CHUCKS, AERO, AUTOMATIC
Hannifin Mfg. Co., Chicago, Ill.

CHUCKS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, COLLET

CHUCKS, DRILL, LATHE AND UNIVERSAL

Manufacturers Equipment Co., Chicago, Ill.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont.

CHUCKS, FRICTION AND TAP

CHUCKS, MAGNETIC
H. E. Schneider, 325 New Birks Bldg., Montreal.

CHUCKS, RING, WHEEL

CHUCKS, SPLIT

CHUCKING MACHINES

CLOCKS, WATCHMAN, PORTABLE

CLUTCHES, CHAIN

CLUTCHES, FRICTION AND PULLEY

COAL HANDLING MACHINERY

COILING MACHINERY, WIRE AND SPRING

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Zenith Steel & Coal Products, Montreal, Que.

COLLARS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener, Ont.

COLLETS
Becker Milling Machine Co., Boston, Mass.
Hannifin Mfg. Co., Chicago, Ill.
Hardinge Bros., Inc., Chicago, Ill.

COMPOSITION INGOT

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Hinckley Machine Co., Hinckley, Ill.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

CONTRACT WORK

CONTROLLERS AND STARTERS, ELECTRIC MOTORS
A. R. Williams Machy. Co., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, STEEL SLIDE-BLOW
Whiting Foundry Equipment Co., Harvey, Ill.

COPING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
John Bertram & Sons Co., Dundas.
Niles-Bement-Pond Co., New York.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

COUNTERSHAFTS
Baird Machine Co., Bridgeport, Conn.
Foster Machine Co., Elkhart, Ind.
Sagw Mfg. Co., Binghampton, N.Y.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.

COUPLINGS, PLAIN AND FLEXIBLE
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

CRANES, LOCOMOTIVE
Northern Crane Works, Walkerville.

CRANES, GANTRY
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, GOLIATH AND PNEUMATIC
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Hepburn, John T., Ltd., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CUPOLAS
Can. Blower & Forge Co., Kitchener, Ont.
Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPOLA BLAST GAUGES & BLOWERS
Sheldons, Ltd., Galt, Ont.

CUTTER GRINDERS AND ATTACHMENTS
Cincinnati Milling Machine Co., Cincinnati.
Garlock Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Monarch Brass Mfg. Co., Toronto, Ont.
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co. of Canada, Toronto

CUTTERS, PIPE (SEE PIPE CUTTERS)

CUTTERS, MILLING
Becker Milling Machine Co., Boston, Mass.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Mach. Co., Cleveland, Ohio.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machinery Co., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining & Mfg. Co., Toronto.
Elm Cutting Oil Co., Toronto.
Racine Tool & Machine Co., Racine, Wis.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Foss & Hill Machinery Co., Montreal.
Galt & Walker Machinery Co., Toronto, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hurlbut, Rogers Machy. Co., South Sudbury, Mass
John H. Hall & Sons, Brantford, Ont.
Wm. Kennedy & Sons, Owen Sound, Ont.
Niles Bement Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis.
Standard Mchy. & Supplies, Ltd., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

CYLINDERS, AIR
Manufacturers Equipment Co., Chicago, Ill.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.

DAMPER REGULATORS
Canadian Fairbanks-Morse Co., Ltd., Montreal.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Marsh & Henthorn, Ltd., Belleville, Ont.
Winnipeg Gear & Engr. Co., Winnipeg, Man.

DIAMONDS, BLACK AND ROUGH
Geo. A. Joyce Co., Ltd., New York.

DIAMOND TOOLS
Francis & Co., Hartford, Conn.
Geo. A. Joyce Co., Ltd., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Banfield, W. H., & Son, Toronto.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Foss & Hill Machy. Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Wells Brothers of Canada, Galt, Ont.

DIES FOR BIT BRACE USE
Wells Brothers Co. of Canada Galt, Ont

DIES, NOSING
Marsh & Henthorn, Ltd., Belleville, Ont.

DIES, PIPE THREADING
Landis Machine Co., Waynesboro, Pa.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

The Appearance of Some Things
Is Their Chief Selling Point
— BUT NOT WITH MACHINE TOOLS

WITH THEM IT IS ALWAYS A QUESTION OF PERFORMANCE, OF HOW WELL THEY CAN WORK AND HOW LONG THEY CAN CONTINUE TO DO SO. THAT IS WHY SO MANY MEN INTERESTED IN PRODUCTION PROBLEMS ARE SPECIFYING "MORSE" DRILLS, THE TOOLS WITH A PROVEN ABILITY TO WORK WELL AND LONG.

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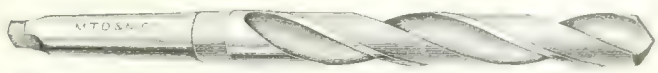
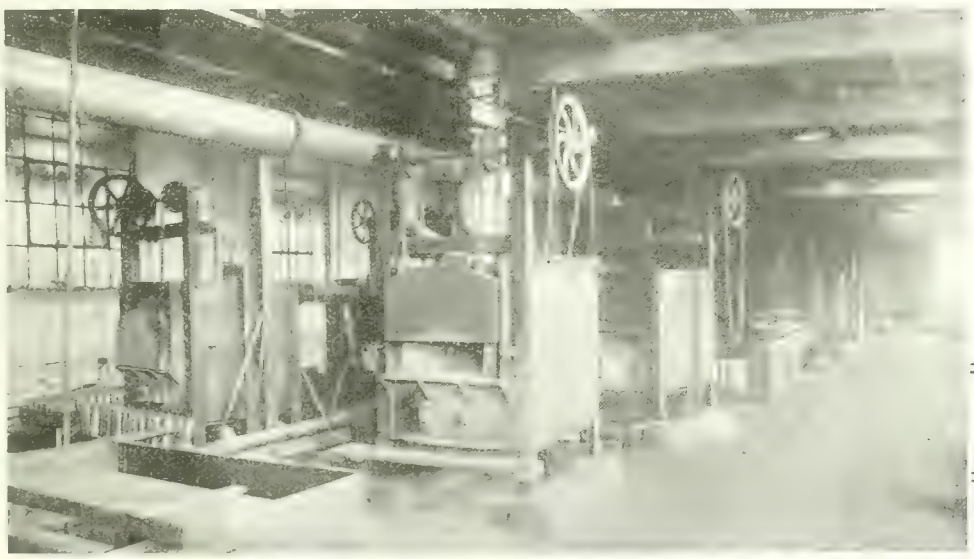


Morse Twist Drill & Machine Company
NEW BEDFORD MASS., U.S.A.



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The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

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DISCS, LEATHER

DRESSERS, GRINDING, AND EMERY WHEEL

DRILL PRESSES

Garlock-Walker Machinery Co., Toronto, Ont.

DRILLING MACHINES, BENCH

Martin Machine Co., Greenfield, Mass.

DRILLING MACHINES, GANG

Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE

Bilton Mach. Tool Co., Bridgeport, Conn.
Fox Machine Co., Jackson, Mich
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

DRILLING MACHINES, RADIAL AND TURRET

John Bertram & Sons Co., Dundas.
Canada Machinery Corp., Galt, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Niles-Bement-Pond Co., New York.

DRILLING MACHINES, SENSITIVE

Aikenhead Hardware Co., Toronto, Ont.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
De Mooy Machine Co., Cleveland, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
United States Mach. Tool Co., Cincinnati, Ohio.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL

Niles-Bement-Pond Co., New York.

DRILLS, BENCH

DRILLS, BLACKSMITH AND BIT STOCK

DRILLS, CENTRE

Aikenhead Hardware Co., Toronto, Ont.

DRILLS, ELECTRIC AND PORTABLE

Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Independent Pneumatic Tool Co., Chicago.
Prest-O-Lite Co., Inc., Toronto, Ont.
Stow Mfg. Co., Binghamton, N.Y.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

DRILLS, HIGH SPEED

Canadian Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Foss & Hill Machy. Co., Montreal.
M. Kenna Brothers, Pittsburgh, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
W. F. & John Barnes Co., Rockford, Ill.
Pratt & Whitney Co., Dundas, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.

DRILLS, MULTIPLE SPINDLE

Henry & Wright Mfg. Co., Hartford, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRILLS, OIL TUBE

Cleveland Twist Drill Co., Cleveland

DRILLS, PNEUMATIC

Can. Ingersoll-Rand Co., Sherbrooke, Que.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, PNEUMATIC CORNER

Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto, Ont.

DRILLS, RATCHET AND HAND

Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Canadian Fairbanks-Morse Co., Montreal
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Garlock-Walker Machinery Co., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.

DRILLS, ROCK

Can. Ingersoll-Rand Co., Sherbrooke, Que.
Foss & Hill Machy. Co., Montreal
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK

Cleveland Twist Drill Co., Cleveland.
Clark Equipment Co., Buchanan, Mich.
Foss & Hill Machy. Co., Montreal.

DRILLS, TWIST

Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago
Armstrong, Whitworth of Canada, Ltd., Montreal.
Canadian Fairbanks-Morse Co., Montreal.
Clark Equipment Co., Buchanan, Mich
Cleveland Twist Drill Co., Cleveland.

Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg Co., St. Catharines, Ont.

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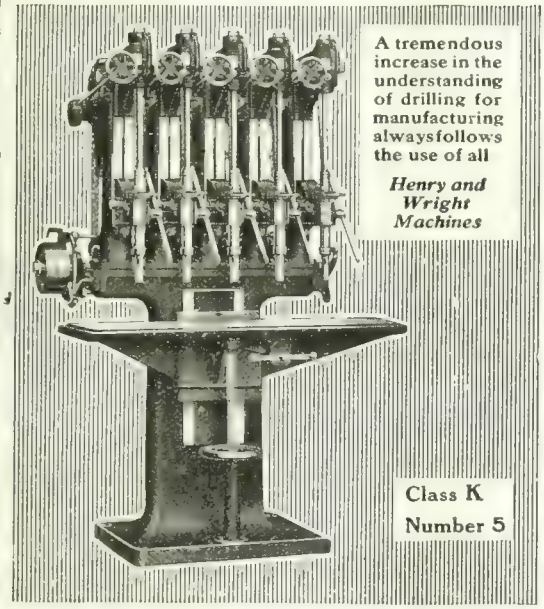

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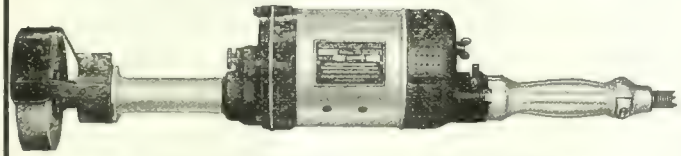

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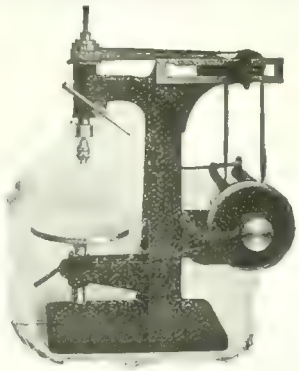

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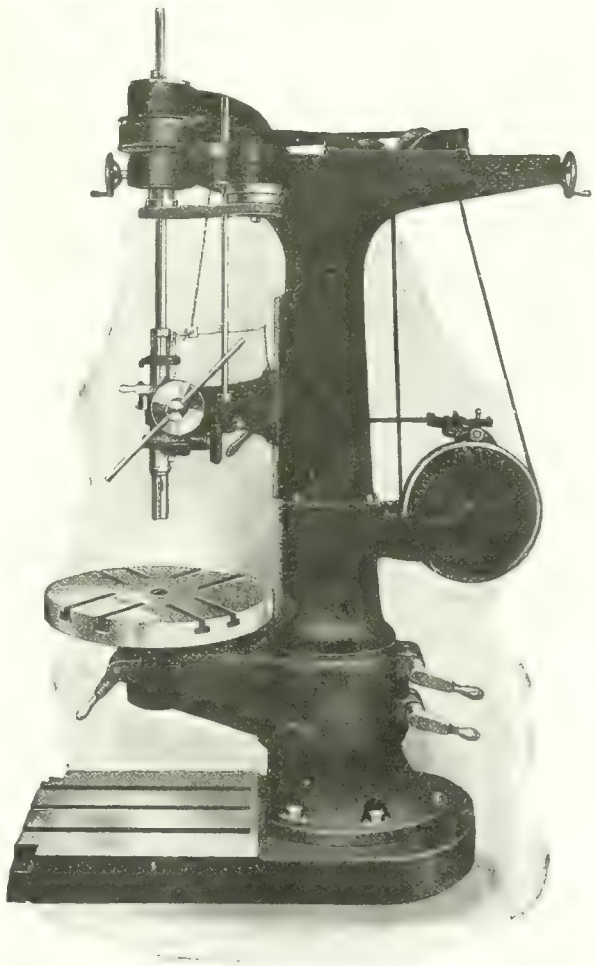

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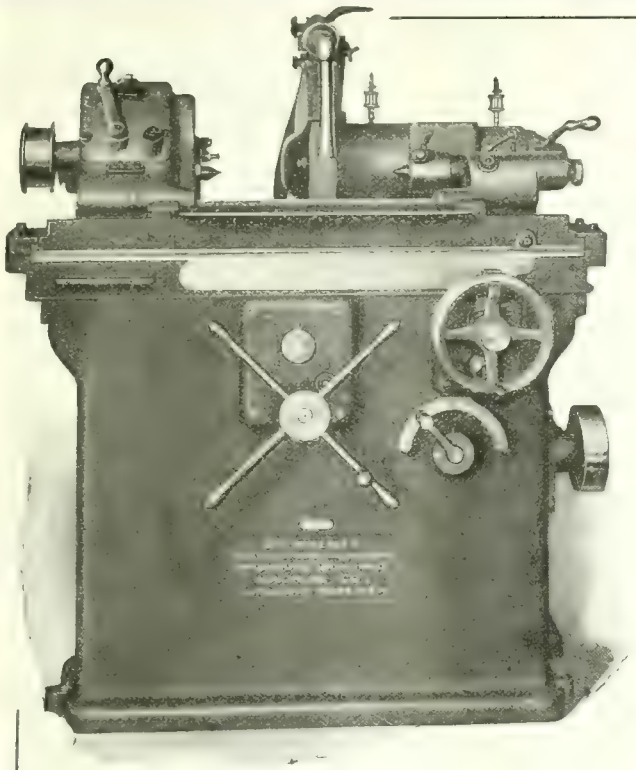

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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.

SANDING MACHINES
Canada Machinery Corp., Galt, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Gardner, Robt., & Son, Montreal
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont
A. R. Williams Machy. Co., Toronto

SAWS, CIRCULAR METAL
Hunter Saw & Machine Co., Pittsburg, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa

SAWS, HACK (SEE HACK SAWS)

SAWS, INSERTED TOOTH
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Napier Saw Works, Springfield, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, BAND AND COPING
Napier Saw Works, Springfield, Mass.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York City
H. E. Strecker, New Birks Bldg., Montreal, Que.

SCREW MACHINE PARTS
Johnson Mach. Co., Carlyle, Manchester, Conn.

SCREW MACHINE PRODUCTS
Galt Machine Screw Co., Galt, Ont.
Eastern Mach. Screw Corp., New Haven, Conn.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York
Himoff Mach. Co., Inc., Astoria, L.I., New York.
A. B. Jardine & Co., Hespeler
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto

SCREW MACHINES, AUTOMATIC, MULTIPLE SPINDLE
New Britain Machine Co., New Britain, Conn.
Riverside Machinery Depot, Detroit, Mich.

SCREWS
Can. B. K. Morton, Toronto, Montreal
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio
Steel Co. of Canada, Ltd., Hamilton, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SCREW SLOTTERS
Garvin Machine Co., New York
Pratt & Whitney Co., Dundas, Ont.

SECOND-HAND MACHINERY
Davis Machine Tool Co., W. F., New York
Dominion Machinery Co., Toronto
Foss & Hill Machy. Co., Montreal
Hill, Clarke & Co., Chicago, Ill.
McCabe, J. J., New York, N.Y.
New York Machinery Exchange, New York
Petrie, Ltd., H. W., Toronto, Ont.
Riverside Machinery Depot, Detroit, Mich.
Strelinger Co., Chas. A., Detroit, Mich.
Stocker-Rumely-Wachs, Chicago, Ill.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto, Ont.
Allen Mfg. Co., Hartford, Conn.
Wilkinson & Kompass, Hamilton, Ont.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas
Can. Fairbanks-Morse Co., Montreal
Canada Machinery Corp., Galt, Ont.
Foss & Hill Machy. Co., Montreal
Gardner, Robt., & Son, Montreal
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Steptoe Co., John, Cincinnati, Ohio

SHAFTING
Can. Bond Hanger & Coup. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sterling Electric Works, Winnipeg, Man.
Strelinger Co., Chas. A., Detroit, Mich.
A. R. Williams Machy. Co., Toronto
Wilkinson & Kompass, Hamilton, Ont.

SHAFTS, FLEXIBLE
Stow Mfg. Co., Binghampton, N.Y.

SHARPENING STONES
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.

SHAVINGS, SEPARATOR
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

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SHEARS, POWER
SHEARS, PNEUMATIC
SHEARS, SQUARING.
SHEET METAL WORKING TOOLS
SHEET METAL STAMPINGS
Dominion Forge & Stmpg Co., Walkerville, Ont.
SHELL BANDING MACHINES.
HYDRAULIC
Canada Wheel Machy. Co., Ltd., Toronto, Ont.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
Metal Wood Mfg. Co., Detroit, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
West Tire Setter Co., Rochester, N.Y.
SHELL PAINTING MACHINES
Can. Blower & Forge Co., Kitchener, Ont.
Shaldons, Ltd., Galt, Ont.
SHELL RIVETERS
Grant Mfg. & Machine Co., Bridgeport, Conn
High Speed Hammer Co., Rochester, N.Y.
SHELL TOOLS
SHRAPNEL SHELL MARKER
Brown, Boggs & Co., Hamilton, Canada
Noble & Westbrook Mfg. Co., Hartford, Conn
SIDE TOOLS
Armstrong Bros. Tool Co., Chicago
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. B. K. Morton, Toronto, Montreal.
SIGNS, ENAMEL
Strong, Kennard & Nutt Co., Cleveland, Ohio
SILENT CHAINS
SILVER SOLDER
Geo. H. Lees & Co., Hamilton, Ont.
SKATE SHARPENERS
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont
SLOTTERS
Garvin Machine Co., New York.
National Acme Co., Cleveland, Ohio
Niles Bement Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.
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The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke, Que.
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Brown & Sharpe Mfg. Co., Providence.
Clark Equipment Co., Buchanan, Mich.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. H. Williams & Co., Brooklyn, N.Y.
SOCKET HEAD CAP SCREWS
Allen Mfg. Co., Hartford, Conn.
SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Peerless Machine Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Canada
SOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Barnfield, W. H., & Sons, Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Charles E. Elmes Eng. Works, Chicago.
Ferracute Mach. Co., Bridgeton, N.J.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Garvin Machine Co., New York.
Gisholt & Billard, Inc., Courtland, N.Y.
Grant Mfg. & Machy. Co., Bridgeport, Conn.
Hall Mfg. & Mch. Co., Toronto, Ont.
John H. Hall & Sons, Brantford.
Hydraulic Machy. Co., Inc., Astoria, L.I., New York
Illinois Tool Works, Chicago, Ill.
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McClean & Son, F. W., Niagara Falls, Ont.
National-Acme Co., Cleveland, Ohio.
D. MacKenzie Machinery Co., Guelph, Ont.
Mulliner & Enlund Tool Co., Syracuse, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rhodes Mfg. Co., Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Sleeper & Hartley, Inc., Worcester, Mass.
Smart-Turner Machine Co., Hamilton, Ont.
T. C. M. Mfg. Co., Harrison, N.J.
Victoria Foundry Co., Ottawa, Ont.
Welland Vale Manufacturing Co., Welland, Ont.
William R. Perrin, Ltd., Toronto
Winnipeg Gen. & Elec. Co., Winnipeg, Man
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Wallace Co., Bristol, Conn
Can. Steel Foundries Ltd., Montreal, Que.
Cleveland Wire Spring Co., Cleveland.
Jas. Steele Ltd., Guelph, Ont.
SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York
Sleeper & Hartley, Inc., Worcester, Mass.
SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
SPIRAL CONVEYORS
Can. Matthews Gravity Carrier Co., Toronto, Ont.
SPROCKETS, CHAIN
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
SOLDER
Jenkins Bros., Hamilton, Ont.
SPROCKET WHEELS, CAST
Perrin, Wm. R., Toronto.
STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.
STAMPINGS
Dillon Mfg. Co., Oshawa, Ont.
Dom. Forge & Stamping Co., Walkerville, Ont
Horner & Wilson, Hamilton, Ont.
STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Canada Machinery Corp., Galt, Ont.
Ferracute Mach. Co., Bridgton, N.J.
Noble & Westbrook Mfg. Co., Hartford, Conn.
STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H. & Co., Hartford, Conn.
Noble & Westbrook Mfg. Co., Hartford, Conn
Pritchard-Andrews Co., Ottawa, Can.
STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.
STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Can. Morehead Mfg. Co., Woodstock, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sheldons, Ltd., Galt, Ont.
The Smart Turner Machine Co., Hamilton
Sturtevant Co., B. F., Galt, Ont.
STEEL ALLOY (SEE ALLOY STEEL)
STEEL BENDING BRAKES
Steel Bending Brake Works, Ltd., Chatham, Ont
STEEL FOR AXES, PLOWS, SAWS, DRILLS, ETC.
Colonial Steel Co., Pittsburgh, Pa.
STEEL, CARBON, FERRO-TUNGSTEN
Can. B. K. Morton, Toronto, Montreal.
Colonial Steel Co., Pittsburgh, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa
Zenith Coal & Steel Products, Montreal, Que
STEEL, COLD ROLLED
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.
STEEL DRUMS
Smart-Turner Machine Co., Hamilton, Ont.
STEEL PRESSURE BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.
Sturtevant Co., B. F., Galt, Ont.
STEEL, HIGH SPEED
Armstrong Whitworth of Canada, Ltd., Montreal
Can. Fairbanks-Morse Co., Montreal.
Can. B. K. Morton, Toronto, Montreal.
Century Steel Co. of America, New York
Colonial Steel Co., Pittsburgh, Pa.
H. A. Drury Co., Ltd., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Fairley Davidson Steel Co., New York, N.Y.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.
Standard Alloys Company, Pittsburgh, Pa
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.
Zenith Coal & Steel Products, Montreal, Que.
STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
Fairley Davidson Steel Co., New York, N.Y.
STEEL, VANADIUM
Drury, H. A., Co., Montreal, Que.
Standard Alloys Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
STELLITE, HIGH-SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.
STOCK RACKS FOR BARS, PIPING, ETC.
New Britain Machine Co., New Britain, Conn.
STOCKS, PIPE
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
STOOLS, STEEL, SHOP
New Britain Machine Co., New Britain, Conn.
STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.
SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal
TACK (DOUBLE POINT) MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.
TANKS, GASOLINE AND OIL
Bowser & Co., Inc., S. F., Toronto, Ont.
Dominion Forge & Stamping Co., Walkerville.
The Jenckes Mach. Co., Ltd., Sherbrooke, Que.
MacKinnon, Holmes & Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
TANKS, STEEL, WATER PRESSURE
Bowser & Co., Inc., S. F., Toronto, Ont.
Can. Welding Works, Montreal, Que.
Jenckes Machine Co., Sherbrooke, Que.
MacKinnon, Holmes Co., Sherbrooke.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.
TANK WAGONS
Jenckes Mach. Co., Sherbrooke, Que
MacKinnon, Holmes Co., Sherbrooke
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto.
TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.
TAPPING MACHINES (PENUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto.
TAPPING MACHINES AND ATTACHMENTS
Bertram, John, & Sons Co., Dundas
Canada Machinery Corp., Galt, Ont
Garvin Machine Co., New York
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Bement Pond Co., New York
Petrie, Ltd., H. W., Toronto, Ont.
Petrie & Montreal Ltd., H. W., Montreal, Que
Rickert-Shafer Co., Erie, Pa.
L. S. Starrett Co., Athol, Mass
Whitney Mfg. Co., Hartford, Conn.
TAPS, ADJUSTABLE
Baxter Co., Ltd., J. R., Montreal, Que.
Geometric Tool Co., New Haven
Manufacturers Equipment Co., Chicago, Ill.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
TAPS, COLLAPSIBLE
Geometric Tool Co., New Haven
Manufacturers Equipment Co., Chicago, Ill.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Victor Tool Co., Waynesboro, Pa.
TAPS, DIES AND WRENCHES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss & Hill Machy. Co., Montreal.
Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Murchey Machine & Tool Co., Detroit.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starrett Co., Athol, Mass.
Wells Bros. Co. of Canada, Galt, Ont.
TAP EXTENSIONS
Allen Mfg. Co., Hartford, Conn.
TESTING INSTRUMENTS METALLURGICAL
Holz, Herman A., 1 Madison Ave., New York.
Shore Instrument & Mfg. Co., New York City.
THERMOMETERS, ALL KINDS
Taylor Instrument Co., Rochester, N.Y.
Bellevue Industrial Furnace Co., Detroit, Mich
TESTING LABORATORIES
Can. Inspection & Testing Lab., Montreal, Que.
Toronto Testing Laboratory, Toronto.
THREAD-CUTTING MACHINES
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
THREADING TOOLS
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rivett Lathe & Grinder Co., Brighton, Mass.
THREAD MILLING MACHINES
Gray Mfg. & Mach. Co., Toronto, Ont.
Taft-Peirce Co., New York, N.Y.
TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Peck, Stow & Wilcox, Southington, Conn.
TIRE SETTING MACHINES, HYDRAULIC
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.
TOOL CASES
Embree, Ira, 231 Emerald St. N., Hamilton, Ont.
Union Tool Chest Works, Rochester, N.Y.
TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Can. B. K. Morton, Toronto, Montreal.
Deloro Smelting & Refining Co., Toronto, Ont.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
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Colonial Steel Co., Pittsburgh, Pa.
Deloro Smelting & Refining Co., Toronto, Ont.
H. A. Drury Co., Montreal.
Eagle & Globe Steel Co., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall & Co., Geo. A., Toronto, Ont.
Osborn (Canada), Ltd., Sam'l, Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Swedish Steel & Importing Co., Montreal, Que.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago, Ill.
Stow Mfg. Co., Binghamton, N.Y.
A. R. Williams Machinery Co., Toronto.
United States Elec. Tool Co., Cincinnati, O.

TOOLS, PNEUMATIC
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TORCHES, STEEL
Armstrong, Whitworth of Canada, Ltd., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.

TRACK SYSTEMS
Dillon Mfg. Co., Oshawa, Ont.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
A. R. Williams Machinery Co., Toronto.
Can. Bond Hanger & Cplg. Co., Alexandria, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Petrie, Ltd., H. W., Toronto, Ont.
The Smart-Turner Machine Co., Hamilton.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.

TRANSMISSION TOWERS
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Wright Mfg. Co., Lisbon, Ohio.

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Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing Co., Toronto.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS, LUMBER AND KILN
Sheldons, Ltd., Galt, Ont.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS & COPPER
Standard Tube & Fence Co., Woodstock, Ont.

TUBING COILERS, FLEXIBLE METAL
Sleeper & Hartley, Inc., Worcester, Mass.

TUMBLING BARRELS
Baird Machine Co., Bridgeport, Conn.
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

TUNGSTEN FILAMENT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

TURNBUCKLES
Canadian Billings & Spencer, Ltd., Welland.

TURNTABLES
Whiting Foundry Equipment Co., Harvey, Ill.

TURRET MACHINES
Brown & Sharpe Mfg. Co., Providence
Garlock-Walker Machinery Co., Toronto, Ont.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney, Hartford, Conn.
Riverside Machinery Depot, Detroit, Mich.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURBINE WATER WHEELS
Jenckes Mach. Co., Sherbrooke, Que.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.

UPSETTING AND BENDING MACHINERY
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton, Canada.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Jenckes Mach. Co., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

VACUUM PUMPS
Can. Blower & Forge Co., Kitchener, Ont.
Smart-Turner Machine Co., Hamilton, Ont.

VALVE LEATHERS
Can. B. K. Morton, Toronto, Montreal.
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto

VALVES, FOOT
Smart-Turner Machine Co., Hamilton, Ont.

VALVES, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago, Ill.
Metalwood Mfg. Co., Detroit, Mich.

VALVES, BACK PRESSURE, STEAM
Sheldons, Limited, Galt, Ont.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Limited, Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Galt, Ont.
A. R. Williams Machy. Co., Toronto.

VISES, AIR OPERATED
Hannifin Mfg. Co., Chicago, Ill.

VISE STANDS, PORTABLE
New Britain Machine Co., New Britain, Conn.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Cleveland Milling Machine Co.
Lees & Hill Machy. Co., Montreal.
New Britain Machine Co., New Britain, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Petrie of Montreal, Ltd., H. W., Montreal, Que.

VISES, PIPE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Wells Bros. Co. of Canada, Galt, Ont.
J. H. Williams & Co., Brooklyn, N.Y.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Barnes, Wallace, Co., Bristol, Conn.
Dillon Mfg. Co., Oshawa, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
London Bolt & Hinge Works, London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Williamson & Kempress, Hamilton, Ont.

WATER PURIFYING AND SOFTENING APPARATUS
Wm. B. Scaife & Sons Co., Pittsburgh, Pa.

WATER CINDER MILLS
Whiting Foundry Equipment Co., Harvey, Ill.

WATER JACKETS
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for DECEMBER

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CANADIAN MACHINERY

AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

Vol. XVIII. TORONTO, NOVEMBER 22, 1917 No. 21

EDITORIAL CONTENTS

FUEL ECONOMY POSSIBILITIES IN BRASS MELTING FURNACES 557-560

GENERAL 560-561

Britain to Use Canadian Materials....Developing Foreign Markets for British Products....Postal Census of Manufacturers.....Smokeless Combustion Problems..... Ganister and Its Use....Effect of Oil on Rough Water.

THE REASON WHY 562

PRODUCTION METHODS AND DEVICES.....563-566

The Manufacture of Hardened Thread Gauges—III.....Dimension Conversion..... Drilling Clutch Sleeves....Mean Proportion....Fuel Measuring Tank.

THE RUSTING OF IRON PIPE IN SERVICE.....567-568

EDITORIAL CORRESPONDENCE 569-570

Does a Piston Stop at Reversal?....Efficiency and Production....Encouraging the Practical.

GENERAL 570

Industrial Alcohol....United States Police to Prevent Factory Outrages.

75-MILLIMETRE SHELL DIMENSIONS 570-571

PROGRESS IN NEW EQUIPMENT 572-573

Elevating Hack Saw Machine for Stock Room Use....Two-Speed Chain Hoist.

EDITORIAL 574

Industrial Activity Anticipates "Victory Loan" Success....Railroad Rates and Service Efficiency.

INDUSTRIAL NOTABILITIES 575

Walter Laurie.

SELECTED MARKET QUOTATIONS 576-577

THE GENERAL MARKET CONDITION AND TENDENCY 577-582

Summary....Montreal Letter....Toronto Letter.....Sydney Letter.....Washington Letter....New York Letter....Pittsburgh Letter.

INDUSTRIAL AND CONSTRUCTION NEWS (Advtg. Section) 61

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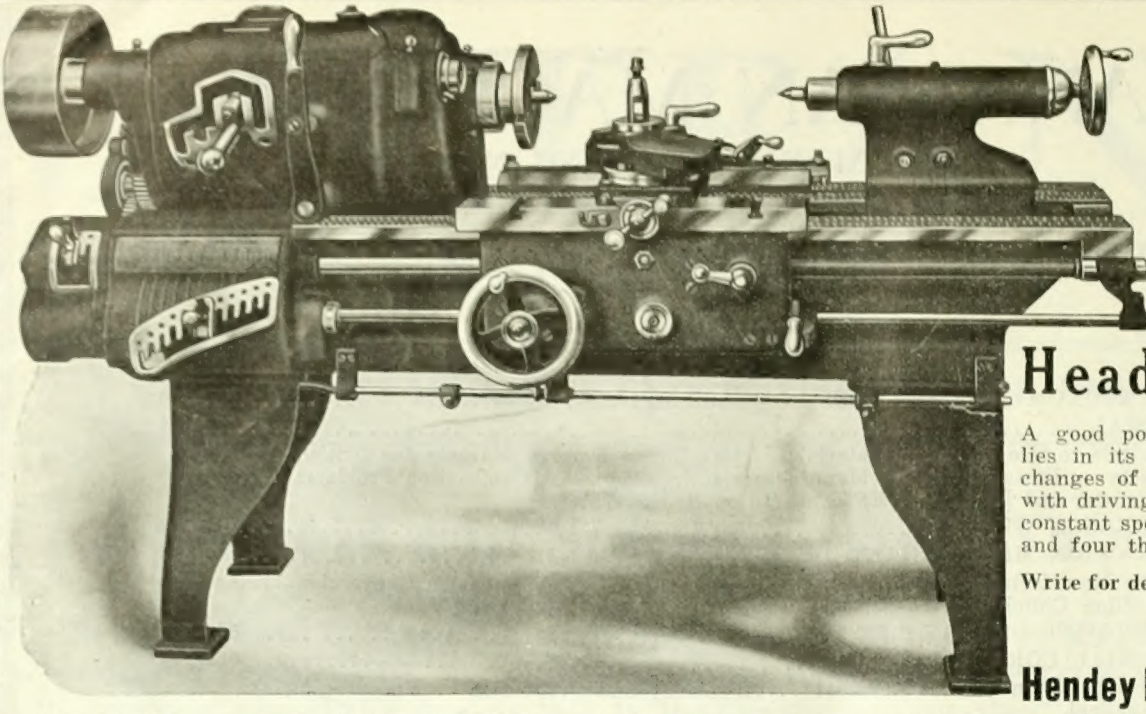

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INDEX TO ADVERTISERS

A

Allen Mfg. Co. 82
Armstrong Bros. Tool Co. 86
Armstrong, Whitworth of Canada... 5
Atkins & Co., Ltd., Wm. 6

B

Baird Machine Co. 85
Banfield, E. J. 65
Banfield, W. H., & Sons 25
Barnes, Wallace, Co. 66
Baxter & Co., Ltd., J. R. 19
Bennett, W. P. 61
Bertram & Sons Co., Ltd., John.... 1
Bertram's, Limited 67
Bilton Machine Tool Co. 24
Blake & Johnson 17
Blashill Wire Machine Co., Ltd... 84
Bliss, Co., E. W. 21
Blount Co., J. G. 76
Brantford Oven & Rack Co. 67
Bridgeford Mach. Tool Works 86
Bristol Company 83
Brownell Machy. Co. 68
Brown's Copper & Brass Rolling Mills 23
Budden, Hanbury A. 67

C

Canada Machinery Corporation, Outside back cover
Canada Metal Co., Ltd. 80
Can. Fairbanks-Morse Co. 34
Can. Ingersoll-Rand Co. 9
Can. Inspection & Testing Laboratories, Ltd. 83
Can. Laco-Philips Co., Ltd. 79
Can. Steel Foundries, Ltd. 7
Can. S K F Co., Ltd. 4
Carlyle Johnson Mach. Co. 8
Chapman Double Ball Bearing Co. 77
Cincinnati Pulley Machy. Co. 93
Cleveland Pneumatic Tool Co. 95
Classified Advertising 68
Clipper Belt Lacer Co. 79
Consolidated Press Co. 20
Cummings & Son 73
Curtis & Curtis Co. 29
Cushman Chuck Co. 83

D

Davis-Bournonville Co. 85
Davis Machine Tool Co., W. F. 71
Deloro Smelting & Refining Co. 13
Diamond Saw and Stamping Works 76
Dixon, C. L. 86
Dominion Forge & Stamping Works 78
Dominion Steel Foundry Co. 83
Drury Co., H. A. 90

E

Eagle & Globe Steel Co. 5
Eastern Machine Screw Corp. 79
Elmes Engr. Works, Charles F. 20
Erie Foundry Co. 20

F

Fairley-Davidson Steel Co., Inc.... 11
Federal Engineering Co. 67
Fetherstonhaugh & Co. 67
Fitchburg Grinding Mach. Co. Inside back cover
Foss & Hill Machinery Co. 97

G

Gardner Machine Co. 85
Garlock-Walker Machy. Co. 16
Garvin Machine Co. 26
Geometric Tool Co. 63
Gilbert & Barker Mfg. Co. 77
Grant Gear Works, Inc. 84
Grant Mfg. & Machine Co. 21
Greenfield Machine Co. 84

H

Hamilton Gear & Machine Co. 75
Hamilton Machine Tool Works 17
Hamilton Motor Works, tLd. 82
Hanna & Co., M. A. 9
Hannifin Mfg. Co. 81
Hawkridge Bros. 65
Hendey Machine Co. 1-4
Henry & Wright Mfg. Co. 93
Hepburn, John T. 16
High Speed Hammer Co. 30
Hinckley Mach. Works 84
Hoyt Metal Co. 85
Hull Iron & Steel Foundries, Ltd. 58
Hunter Saw & Machine Co. 67
Hurlbut-Rogers Machinery Co. 86
Hyde Engineering Works 7

I

Imperial Tobacco Co. of Can., Ltd. 69
Independent Pneumatic Tool Co. 93
Iron Works, The 65

J

Jacobs Mfg. Co. 80
Jenckes Mach. Co. 9, 70
Johnson Machine Co., Carlyle 8

K

Kempsmith Mfg. Co. 26
Kennedy & Sons, Wm. 27
King, Ltd., Warden 18

L

L'Air Liquide Society 12
Lancashire Dynamo & Motor Co. 76
Landis Machine Co. 86
Latrobe Electric Steel Co. 10

M

MacKinnon, Holmes & Co., Ltd. 65
Manufacturers Equipment Co. 21
Marsh & Henthorn, Ltd. 29
Matthews & Co., Inc., Jas. H. 30
McCabe, J. J. 27
McDougal Co., H. Inside back cover
McCoy-Brandt Machy. Co. 70
McKay Co., James 12
McLaren Belting Co., J. C. 85
Mechanical Engineering Co. 89
Metalwood Mfg. Co. 21
Monarch Brass Mfg. Co. 75
Morton Mfg. Co. 65
Morse Twist Drill & Mach. Co. 89
Murchey Machine & Tool Co. 82

N

Napier Saw Works 84
National Service Board 65
New York Machinery Exchange 72
Nicholson File Co. 91
Niles-Bement-Pond... Inside front cover
Northern Crane Works 83
Norton, Ltd., A. O. 84
Norton Co. 33
Norton Grinding Co. 32
Nova Scotia Steel & Coal Co. 14

O

Oven Equipment & Mfg. Co. 101

P

Parmenter & Bulloch Co. 85
Perrin, Wm. R. 21
Peerless Machine Co. 79
Petrie, Ltd., H. W. 69
Port Hope File Mfg. Co. 31
Positive Clutch & Pulley Works.... 86
Pratt & Whitney ..... Inside front cover
Preston Machinery Co. 72
Puro Sanitary Drink'g Fountain Co. 66

R

Racine Tool & Machine Co. 78
Rhodes Mfg. Co. 18
Ridout & Maybee 67
Riverside Machy. Depot 70, 73
Roelofson Machine & Tool Co. 15
Roper & Co., C. F. 78

S

Shuster Co., F. B. 84
Silver Mfg. Co. 84
Skinner Chuck Co. 83
Sleeper & Hartley Co., Inc. 80
Smith Mfg. Co., Philip 16
Standard Alloys Co. 11
Standard Machy. & Supplies, Ltd. 91
Starrett Co., L. S. ..... Front cover, 22
Steel Co. of Canada 3
Steptoe, John, Co. 19
Sterling Engine Works 30
St. Lawrence Welding Co. 82
Stock-Rumley-Wachs Co. 73
Stow Mfg. Co. 97
Streeter, H. E. 85
Strong-Kennard & Nutt Co. 85
Swedish Steel & Importing Co. 12

T

Tabor Mfg. Co. 85
Toronto Iron Works 83
Toronto Testing Laboratory 85
Toronto Tool Co. 75

U

United Hammer Co. 84
U. S. Electric Tool Co. 31

V

Vanadium Alloys Steel 10
Vulcan Crucible Steel Co. 10

W

Warner & Swasey Co. C
Wells Bros. Co. of Canada 31
Whiting Foundry Equipment Co. .. 61
Whitcomb-Blaisdell Mach. Tool Co. 24
Whitman & Barnes Mfg. Co. 25
Wilkinson & Kompass 86
Williams, A. R., Machy. Co. ..7, 61, 69
Williams & Co., J. H. 28
Willson & Co., T. A. 84
Windsor Mach. & Tool Works 14
Wilmarth & Morman Co. 86
Winnipeg Gear & Engineering Co... 75

Z

Zenith Coal & Steel Products Co. 85

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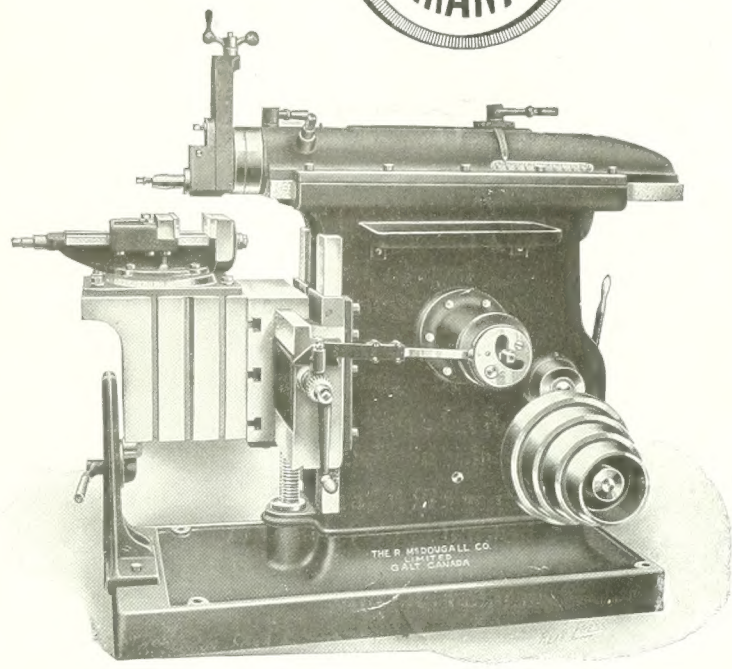

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